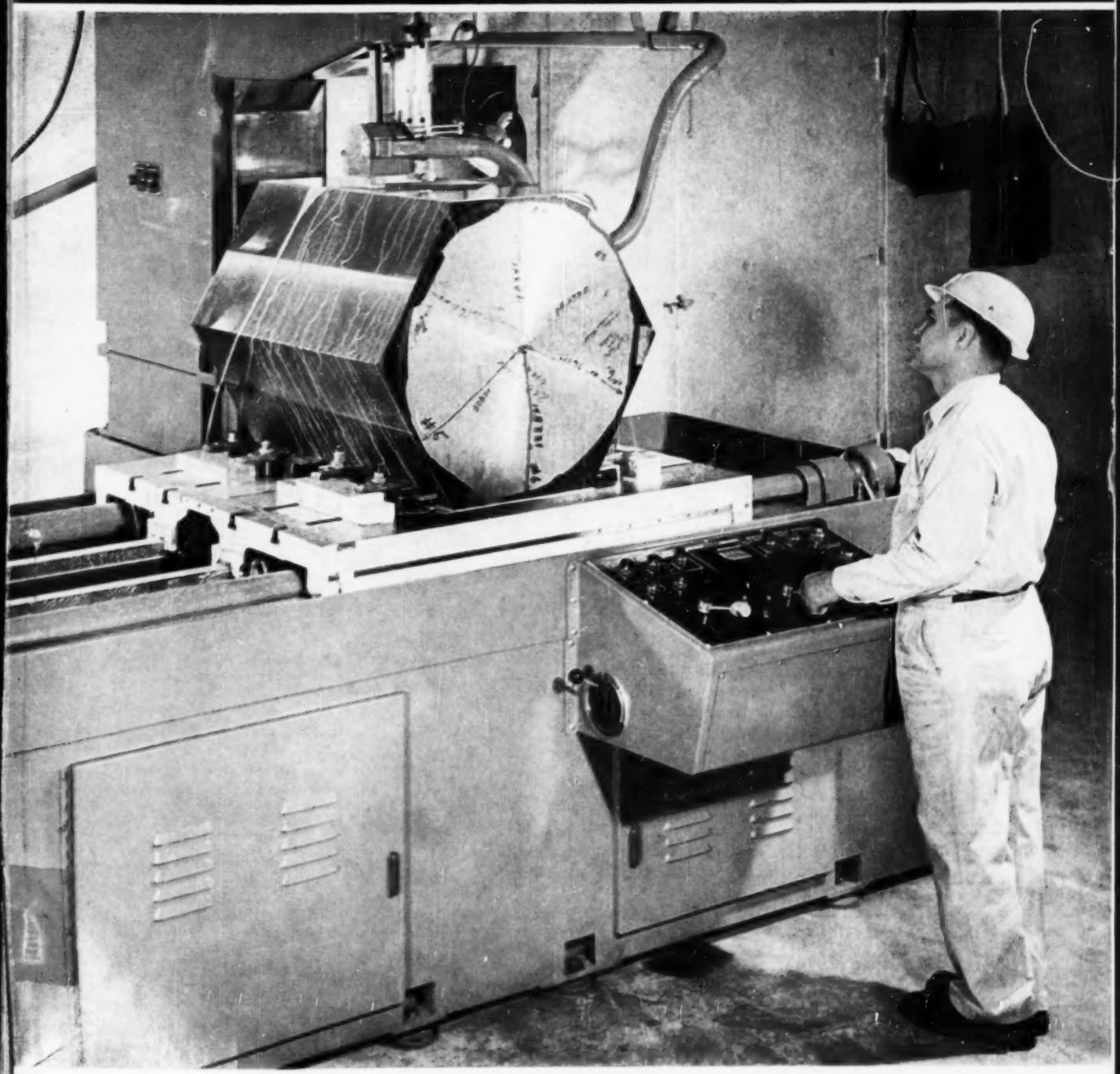
American Machinist

JULY 13, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

VALUE ANALYSIS

A Special Report, page 117



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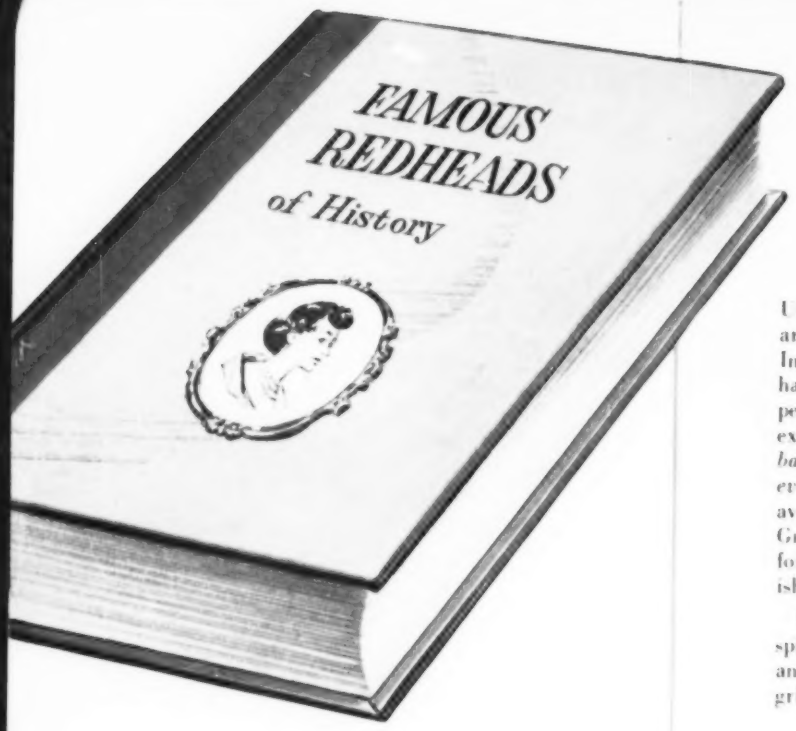

in the past...

Throughout the ages, redheads have acquired a reputation for being glamorous, adventurous, unpredictable and often temperamental—greatly admired or greatly envied. Cleopatra, Queen Elizabeth, Madame Pompadour, Mary Queen of Scots, Lady Hamilton, Nell Gwynn, Madame Dubarry, Sarah Bernhardt—some of history's most tempestuous titian-haired beauties undoubtedly contributed to this fame.

In literature, too, redheads have often been cast in similar roles—like Nana, Sadie Thompson, Becky Sharpe and Scarlett O'Hara, to mention just a few.

The relationship between hair coloring and personality may have been sheer coincidence. But the fact remains that redheads usually stand out from the crowd in more than appearance alone.

RED HEAD HEALD

in the present...

Unlike their feminine counterparts, Heald Red Heads are *not* temperamental and definitely *not* unpredictable. In fact Heald Red Head boringheads and wheelheads have achieved an enviable reputation for dependable performance, based on more than 30 years of operating experience. And today, the Red Head line includes *six basic types*, in sizes, speeds and capacities for virtually *every* metal-working application. Heald Red Heads are available not only for Heald Bore-Matics and Internal Grinders, but also (and many people do not realize this) for use with any similar types or makes of precision finishing machines.

From this complete Red Head line you can select a spindle unit that will help you improve product quality and cut production costs on any boring or internal grinding job.

RED HEAD BELT-DRIVEN WHEELHEADS
Cool-running, permanently lubricated wheelheads for standard belt drive. Sleeve Style, Naked Style and Quill Style heads for speeds up to 40,000 rpm.

RED HEAD HI-FREQUENCY WHEELHEADS
Permanently lubricated or mist lubricated precision wheelheads for Hi-Frequency drive. Naked Style, Quill Style or for mounted point wheels. Speeds up to 100,000 rpm.

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New head design permits small hole grinding at speeds from 15,000 to 100,000 rpm without the need for high frequency generating equipment.

RED HEAD BORINGHEADS
Permanently-lubricated belt-driven boringheads for high-precision Borizing with rotating tools or rotating work. Speeds to 8,000 rpm.; available in a wide range of sizes.

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RED HEAD BORIZERS
Completely self-contained motor driven, hydraulically powered head units for rotating, feeding and retracting single or multiple tools in automated setups.

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American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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TURN PAGE FOR METALWORKING REPORT →

METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES

CUTTING

Speedier Electric Discharge

Silicone fluid used as the dielectric fluid is reported to cut the time required by two-thirds in some cases. In one complex shape the machining time was 12 hours with clean fluid. As the oil got dirty, cutting efficiency decreased and erratic operation became a problem.

When Dow Corning Silicone Fluid 200 was tried, the cutting time on this part dropped to 4 hours. As the silicone oil got dirty, the cutting time again started to climb, reaching 10 hours. Addition of an Alsop sub-micron filter to the system restored the cutting time to the original 4 hours.

Microstoning Improves Geometry

Waviness and lobing of cylindrical parts and ridges on flat ones can be quickly removed by the Supfina attachment for lathes, boring mills and other machine tools. Taft-Peirce Mfg Co, Woonsocket, RI, is now preparing to market the device under license from the West German machine tool firm of Sufina-Wieck & Hentzen. The attachment is now built at Woonsocket, and bonded abrasive stones in a full range of grit sizes and hardnesses are likewise available.

In the "Microstoning" process, as T-P calls it, the abrasive stone is oscillated at frequencies of 2000 to 3000 per min, while the work is rotated at a speed to produce from 20 to 130 sfpm for roughing and up to 400 sfpm for finishing. Stone pressure is 20 to 40 psi, so that the abrading process rapidly removes the amorphous material on the work surface, such as remains from the prior machining process—grinding or turning. A superior surface finish is produced (less than one micro-inch, if desired), and increased bearing area is obtained by reducing small roughness marks.

The Supfina attachment is air driven, but uses only 50 to 100 cu ft per hr for the smaller model. Normally, finishing within 1/64 in. of a shoulder is practical. Smallest practical work size is now around ⅛ in.; above 10 in. dia, one cannot expect to correct out of roundness. Stones can be changed in 2 min. They are mostly silicon-carbide abrasive in grit sizes from 300 to 1200.

FORMING

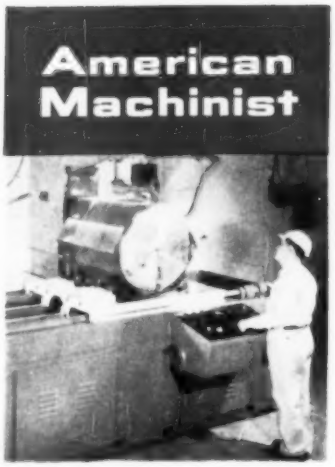
Hydraulics Aid Extrusion

Liquid under high pressure is to be used by the Russians to extrude rod, tubing, and ribbed material like "gears by the yard." Scientists at the Institute of High-Pressure Physics have successfully developed an idea attributed to a U S physicist, Percy Bridgeman. Earlier attempts are said to have ended in failures by metal disintegration.

A blank is placed in the extrusion die so it "corks" the nozzle. Liquid is forced into the die under high pressure in intermittent pulses by a high-pressure pump. As the pressure builds up in the vessel, the metal in the blank is forced through the extrusion nozzle, enveloped in a thin film of the liquid. The unbroken film of liquid prevents metal-to-metal contact of work and nozzle, and reduces wear. Less energy is said to be used than in the case of conventional extrusion with a ram. Rate of extrusion is said to be in the order of 325 ft/second.

DON'T FORGET . . .

***Metalworking Report** is not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents on the page preceding this one. Trends pages are classified by subject and information in them is not repeated elsewhere. Most of the developments in Metalworking Report are so new that further information is not yet available—when it is, you will find a page reference to the article.*



COVER:
The largest powder-metal part ever produced, a beryllium ingot, is bandsawed into thirteen plates that will be assembled into a nuclear reactor. Job was done on a DoALL saw at Brush Beryllium Co, Cleveland, see page 103.

HEAT TREATING

Explosive Hardening

Explosive forming, hailed by some as a process that may eliminate the need for heat treatments, seems more likely to fit in as a useful heat treating tool.

• Explosives have been used for the sole purpose of hardening metal surfaces, reports Propellex Chemical Div, Chromalloy Corp, Edwardsville, Ill. Rather mild charges have been safely and satisfactorily used to harden the surfaces of holes and other details which were too inaccessible to be treated by conventional methods.

• Another report states that though several metals have been explosively hardened, the process is particularly advantageous for manganese steel. Surface hardness and tensile strength can be doubled. An explosive in sheet form that can be cut with a knife is used. Depth and degree of added hardness are determined by thickness, shape and placement of the explosive, which is cemented directly to the surface to be hardened.

• Explosive forming can eliminate straightening problems by making it possible to heat treat some metals before they are fabricated. Many alloys which are readily ruptured by low energy forces show surprising plasticity when subjected to the high-energy explosive forces.

THE OUTLOOK

Metalworking operations promise to continue at a high level all year, subject to temporary setback if steel production should be seriously interrupted. Both capital goods and consumer goods are doing well, with the auto industry providing a special spur, *see p97.*

INSPECTION

Explosive Tests Metals

A metallurgy group at Harvard has been using high explosives to determine the breaking strength of metals with a high degree of "give."

Under direction of ass't prof Richard S Davis, Div of Engineering and Applied Physics, values have been obtained for the previously unknown fracture strengths of extremely ductile metals like high-purity aluminum, which stretches instead of snaps if pulled apart slowly.

Dr Davis bases his testing technique on the principle that a compression wave travelling through a metal plate is reflected from a surface as a tension wave. An intense compression wave may be created by exploding a cylinder of explosive on one side of the plate. This produces an effect much like hitting the plate with an extremely powerful hammer. The compression wave travels through the plate, and when it reaches the free surface, echoes back as a tension wave which tends to pull the plate apart. When this tension exceeds the strength of the plate, it fractures. The wave travels so rapidly through the plate that there is no time for any stretching, or other changes in shape, to occur.

WELDING

English Slag Welder

A report from abroad states that an English firm, Quasi-Arc, Ltd, has developed some competition for the Russian electroslag welding process. That's the technique that butt welds extremely thick sections—up to 12 in. and more.

The joint is positioned vertically, and the weld progresses from bottom to top, the molten puddle being contained in the joint by water-cooled copper shoes at the sides.

The English process is spoken of as "vertical Unionmelt," but the Linde Div of Union Carbide Corp here does not claim any parenthood, says that Quasi-Arc, Ltd, must have adapted the Unionmelt equipment to operate in a manner similar to the Russian machine.

ASSEMBLY

Russians Roll Rivets Tight

Less noise, higher speed, and better results are claimed for a novel Soviet rivet-heading method that replaces hammering. According to the Soviet monthly, "Bulletin of Technical-Economic Information," a shaft-mounted tool with two rollers is pressed against the end of the rivet to flatten the free rivet end to a disk. The tool reportedly works on a lathe or drillpress. Claims for the system include better metallurgical structure, finer finish and accuracy, productivity increased 5 or 6 times, and longer tool life.

Casting Cuts Assembly Problems

Assembly in atomic-power-plant equipment for the future may be simplified in some respects because there is less of it. In piping, for example, it appears that cast stainless-steel fittings will be specified often. Cast stainless fittings are being fabricated for the atompower N S Savannah for three main reasons: The complex shapes are most economically made as castings; the stainless steel provides best combination of corrosion and heat resistance with strength, and the castings can be designed with generous fillets and radii that eliminate crevices that might trap radioactive particles from the power plant. According to experience with the Shippingport power reactor, CF-8 alloy is best choice.

FINISHING

Black Stainless

Although the highly reflective property of stainless steel is one of its important advantages, there are occasions when this is a disadvantage and a flat or glossy ebony finish would be desirable. This can now be produced by a process developed by Armco Steel Corp, Middletown, Ohio, and available without royalty for approved applications.

The technique involves immersing the work in a molten dichromate bath which produces a permanent black oxide film said to be as corrosion-resistant as the original bright finish. The ebonized finish is flat in character but may be brought to a gloss by waxing or the use of a suitable filler.

Principal uses, thus far, have been for architectural trim as a counterpoint to bright stainless, but it looks like a valuable finishing process for precision-cast instrument and machine parts.

Nickel Stripper

Non-electrified, one-bath stripping solution has been developed by Hanson-Van Winkle-Munning Co, Matawan, NJ. Called NI-PLEX, it will completely remove all nickel plating by simple immersion for an hour or less. As the solution does not attack copper, silver, or brazed joints, most assemblies can be stripped without the necessity of disassembling, as is usually necessary when sulfuric acid and sodium cyanide electrolytic baths are employed. The solution is used in a rubber-lined tank and requires checking by analysis only once a week. After stripping, parts are cold-water rinsed, dipped in hydrochloric acid, cold-water rinsed, dipped in water-soluble oil, and dried.

Conversion Coatings

Non-electric, non-fuming chromate conversion coatings that operate at room temperature on zinc, cadmium, aluminum, and magnesium have been developed by Rotor-Finish Ltd, European Metal Finishing Div, Hemel Hempstead, England. Called Tridur, they are available in nine types and include transparent, yellow, and olive green for zinc and cadmium, a coating for aluminum claimed to impart a salt-spray-test life of 3000 hr (1000 hr on Al Cu alloys), and a coating for magnesium with a humidity test life of 250 hr and a salt spray life of 300 hr. Application is by simple immersion.

The olive green coatings for zinc and cadmium will stand 1000 to 1400 hr of salt spray or humidity tests and have a glossy green appearance. Like the aluminum coating, they may be dyed in dark colors —blues, browns, or blacks—for identification.

Transparent coatings that preserve

the original appearance and color of zinc and cadmium, yet increase their life by about eight times, are possible with other Tridur methods.

MATERIALS & COMPONENTS

Seven Silicone-Rubber Compounds

Presenting a number of significant developments in silicone-rubber technology, seven new polymers have been introduced by the Dow-Corning Corp, Midland, Mich. Two of the compounds are basic improvements in the field of fuel and solvent resistant elastomers. One of these compounds, called Silastic LS-63, is the only fluorocarbon silicone on the market. It has 5 to 6 times the resistance to solvents, such as JP-4 jet fuel, as any comparable material.

While most of the thousands of new synthetic polymers are intended for a single product or product area, two of these new materials are intended as master bases. Silastic LS-422 and LS-433 Base permit users to design their own compounds by adding modifiers and thus to tailor the material to their own needs. Another advantage of these bases is that they reduce the need for large inventories of special compounds.

Typically, the LS-422 Base is composed of a fluorosilicone polymer with a quantity of silica filler added. Because it readily accepts additional fillers, compounds up to 80 Durometer (Shore "A" hardness) can be formulated. Compounds can be manufactured into finished goods by processes such as molding, extruding, calendering, and coating.

The other new polymers include: Silastic 52 and Silastic 82, designed for use in parts such as gaskets, seals, diaphragms, and tubing for the aircraft, automotive and appliance industries; Silastic 1601, designed for insulation used on 200-C rated fixture and appliance wire; and Silastic 1602 for dense, homogeneous, thin-walled insulation.

Metal-Ceramic Laminates

Using brazing and hot-pressing techniques, metal-ceramic laminates can be fabricated when the thermal expansion of the ceramic is equal to or slightly less than that of the metal. These laminates have been made and tested at Alfred University for the USAF's Wright Air Development Center. Fosterite-stainless steel 430, molybdenum-alumina, and Kovar-alumina laminates were produced by brazing; laminates of molybdenum and a 40% alumina-60% mullite ceramic were hot-pressed. Thermal expansion and thermal conductivity studies demonstrated that mixtures of mullite and alumina can be used to provide an adjustable range of thermal expansion. Measured conductivities of the stainless-steel laminates were much higher than calculated results.

MANUFACTURING CONTROL

Charga-Plates for Tool Control

Lockheed Aircraft, Marietta, Georgia, issues personal charge plates, like the ones from department stores, to all employees that borrow company tools. This simplifies record-keeping, cuts down on tool-crib man-hours, and makes up a company-wide system that is practically foolproof. Each tool borrower writes up his own "ticket" with carbon copy, including a description of the tool and printed impression of his own charge plate. He checks it with the tool-crib attendant when he takes the tool out, and leaves a copy of the ticket with the attendant. If the employee leaves the department —or the company—all tools charged to him can be determined quickly by checking the company file.

The Impact of Value Analysis

Ever since Value Analysis became a part of the General Electric setup in 1947, much has been written about this management tool. What most people don't realize is that the concepts of Value Analysis are spreading far beyond the confines of GE. At least a dozen really large companies have installed similar programs, and small plants are beginning to get into the act. And the military services are also extremely interested.

At General Electric itself, Value Analysis has become a large-scale operation. Today the company has 120 full-time Value Specialists in its plants. Each of these VA men is expected to save his plant at least $200,000 a year.

For a round-up of what's been happening to Value Analysis at GE during the past ten years with emphasis upon the way that GE trains its Value Specialists, see the Special Report beginning on page 117.

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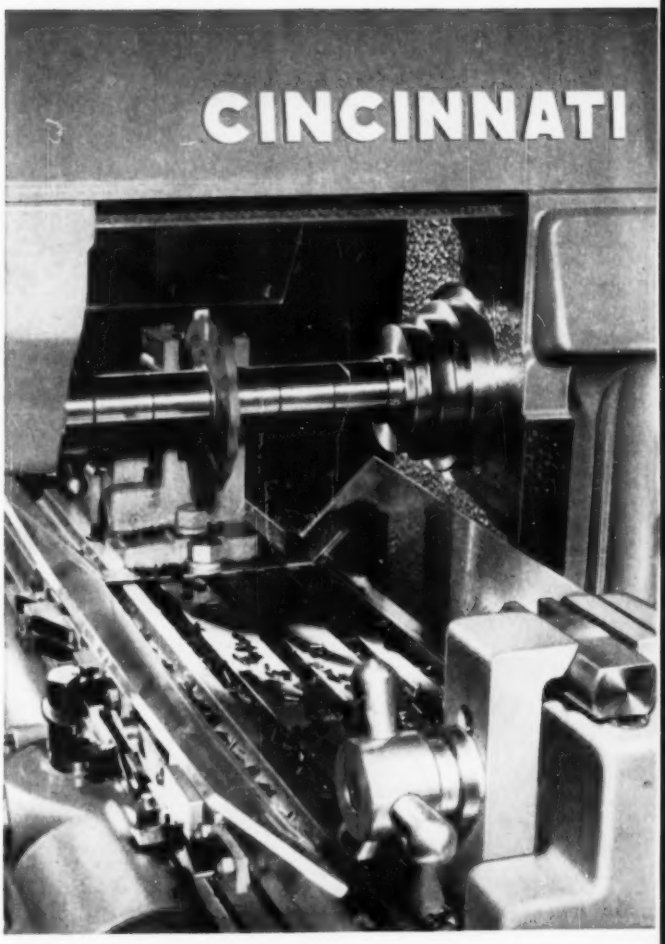
MI Reciprocating Cycle Stops Automatically... Cincinnati's dependable performance continues for Years

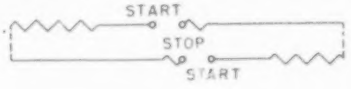
Many shops are benefiting from the extended range of productivity incorporated in Cincinnati knee and column type milling machines. This highly desirable type of "range," obtained through automatic table cycles, augments the wide variety of short run toolroom operations which Cincinnati performs so well. All members of the MI family, the finest toolroom machines in the 3 to 10 hp class, are available with or without automatic table cycles. And when equipped with this productivity feature, an exclusive, cost reducing advantage is included: *Automatic reciprocating milling with center safety stop.*

Just think what this means to you in low-cost production! You can set up a fixture at each end of the table, and mill the part in one while the other fixture is being loaded. To protect the operator, cycle automatically stops midway between the fixtures. This exclusive advantage is brought about by the automatic backlash eliminator device built around the table feed screw. It and other Cincinnati feature-advantages are illustrated on the following two pages.

Automatic table feed cycles, independent overhead spindle, Dynapoise overarm . . . these constitute some of the many advantages gained by replacing old equipment with new CINCINNATI Milling Machines. One other which cannot be illustrated is a high degree of dependable performance. Only Cincinnati Milling can give you the completeness of integration which assures the dependability of uniformly low costs for your production. Ask for MI Milling Machine Catalog M-1995-3. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**



ALMOST CONTINUOUS MILLING with right- and left-hand fixtures . . . a strong plus value offered by CINCINNATI ML and MI Plain and Vertical Milling Machines equipped with Automatic Table Cycles. Cycle diagram below.



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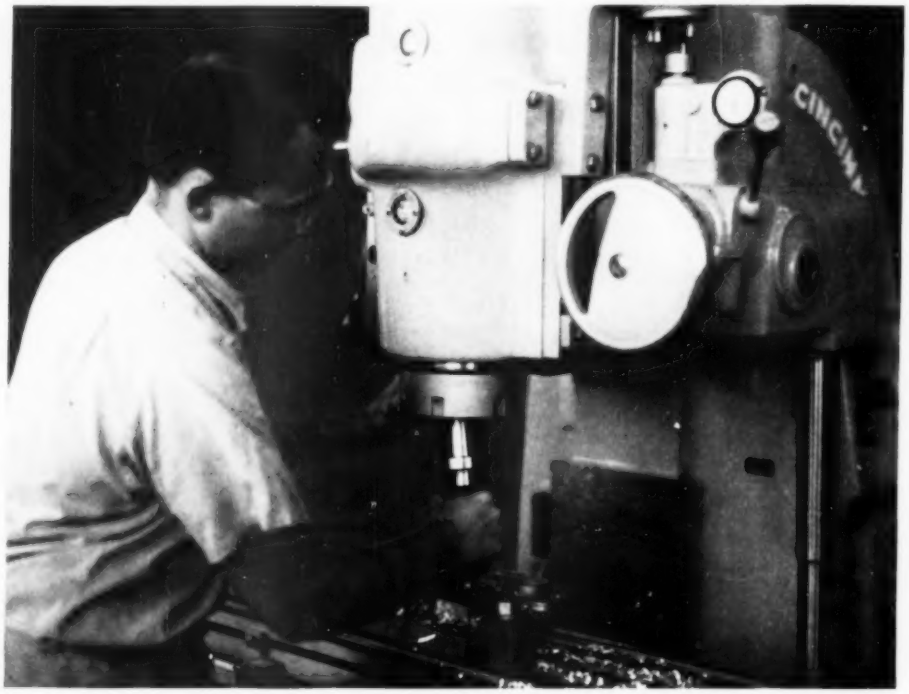

ARBOR-LOC spindle nose, a standard feature-advantage exclusive with Cincinnati, helps operator change cutters safely and quickly (20 seconds or less).

and the Dependability

	Style and Size	Spindle Drive (hp)	Table Travel
PLAIN	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
UNIVERSAL	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
VERTICAL	205-10 MI	5	28"

CINCINNATI

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of the MI Line

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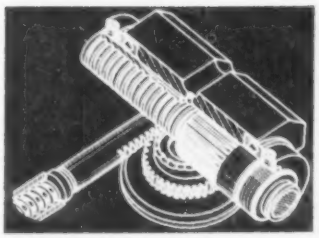
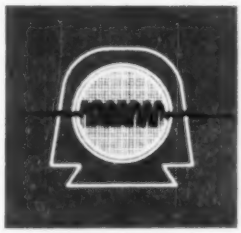
May we give you more information? Ask for Catalog M-1995-3, or a visit by one of our field men.



AUTOMATIC BACKLASH ELIMINATOR operates without attention. There is always a snug fit between feed screw and nut for "climb" milling. This is a standard feature-advantage exclusive with Cincinnati.



DYNAPOISE OVERARM damps self-excited chatter; increases feed rate for troublesome jobs. This is another standard feature-advantage exclusive with Cincinnati.

INDEPENDENT OVERHEAD SPINDLE, an extra equipment item for increasing range and versatility. 3 hp drive.

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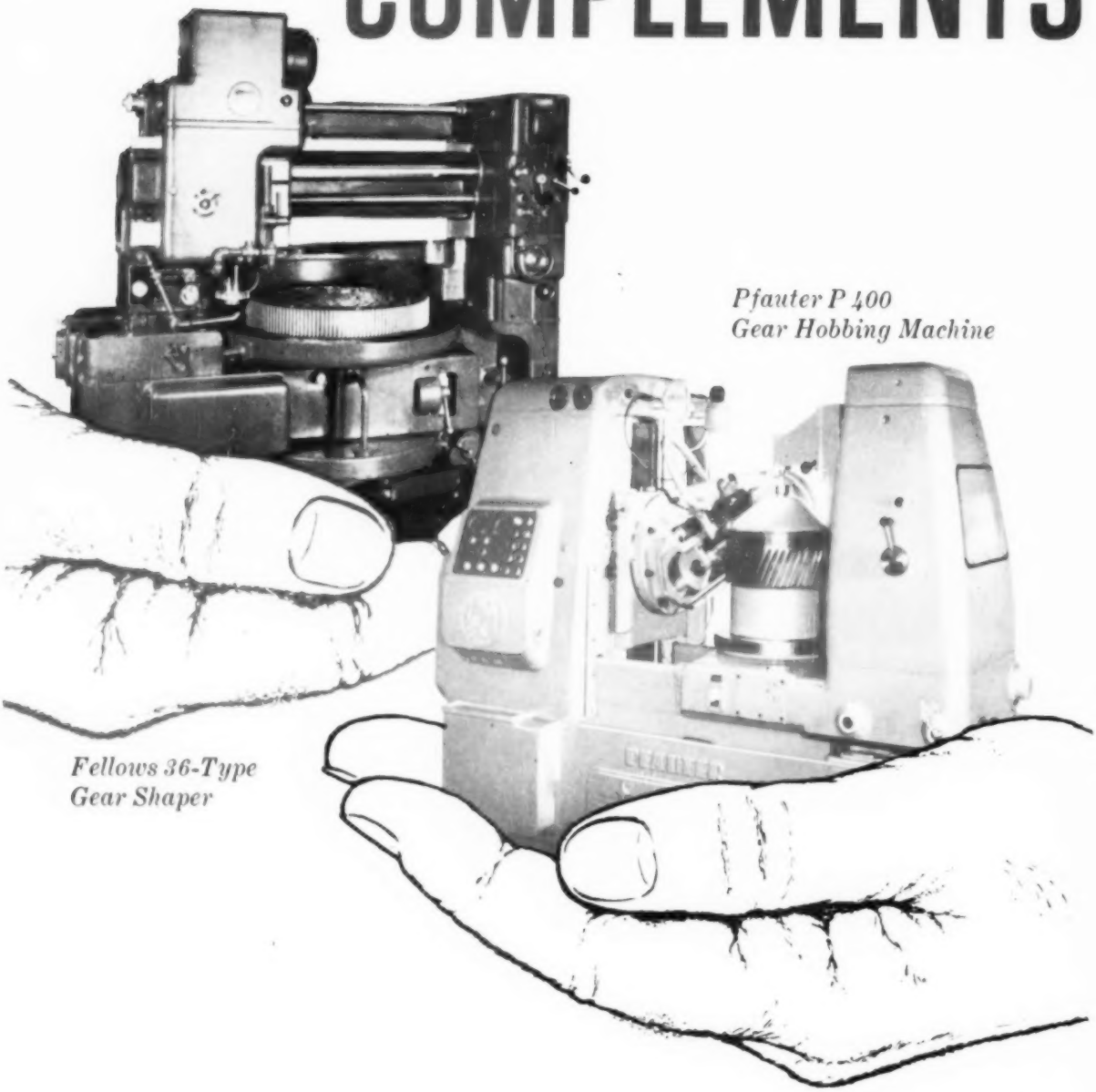
PERFECT COMPLEMENTS



Pfauter P 400
Gear Hobbing Machine

Fellows 36-Type
Gear Shaper

THE
PRECISION
LINE

. . . ✓ FELLOWS GEAR SHAPERS!
✓ PFAUTER GEAR HOBBERS!

Now Fellows sells, and later will manufacture, the world-famous Pfauter Gear Hobbing Machines and Worm Milling Machines.

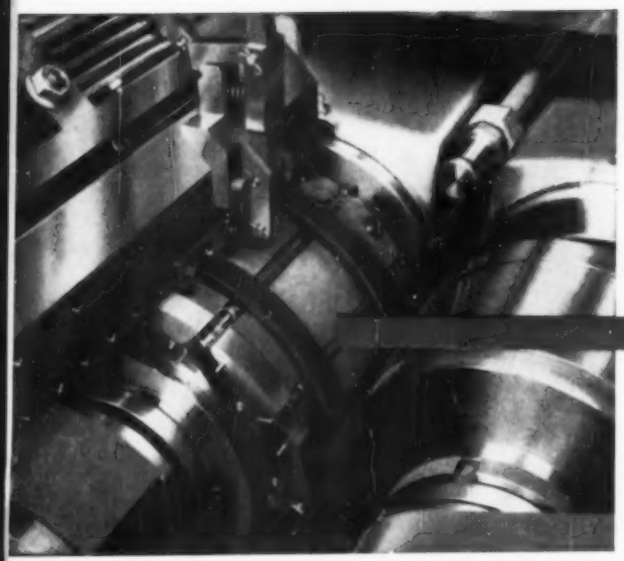
Fellows Gear Shapers and Pfauter Gear Hobbers provide complete coverage of modern gear production equipment needs. Both operate on the molding-generating principle. The Pfauter Hobbers embody every important advance in hobbing technique, in most cases originated by Pfauter. And Fellows Gear Shapers incorporate every major advance in gear production by the Gear Shaper method originated by Fellows.

Among the many features incorporated in Pfauter Hobbers are the differential for helical gear hobbing, the hydraulic backlash eliminator for efficient climb hobbing, the fully automatic plunge for longitudinal and radial-tangential hobbing and, most recently, exclusive Pfauter DIAGONal Hobbing. Capacities of Pfauter machines range from 3" max. P. D., 2¾" max. face width, to 120" max. P. D., 1¼ D. P. and 30" max. face width.

With the addition of the Pfauter line, Fellows provides the most comprehensive service possible in the field of gear production equipment. Your Fellows representative can give you full information about our machines and instruments which cover every phase of gear production.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

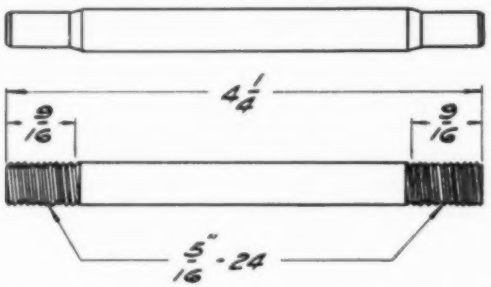


264 threads per minute

(132 double-end studs) *

Both Threads Rolled to a Class 3 Fit by the Lanhyrol Machine in a Single Threading Cycle . . . at Columbus Bolt and Forging Co. (Columbus, O.)

More than 350,000 Parts Per Die Set . . . over 3½ times the die life realized from other previous thread rolling methods.



AISI 1335 and 1041 Steel (210-220 Brinnel) as Cold-Drawn and Extruded . . . not spheroidized or annealed.

Larger and Longer Sizes, Both Single and Double-End Studs, Can Be Rolled . . . manual, semi-automatic or automatic rolling can be accomplished by the same machine on standard fasteners or highly specialized parts. Automatic hopper feeding and orienting devices available for automated operations. Ask for Bulletin E-60 . . . send specifications.

*LANDIS Research and Development has currently completed improvements in this process to increase the present production to 320 threads (160 studs) per minute with an even greater roll life.

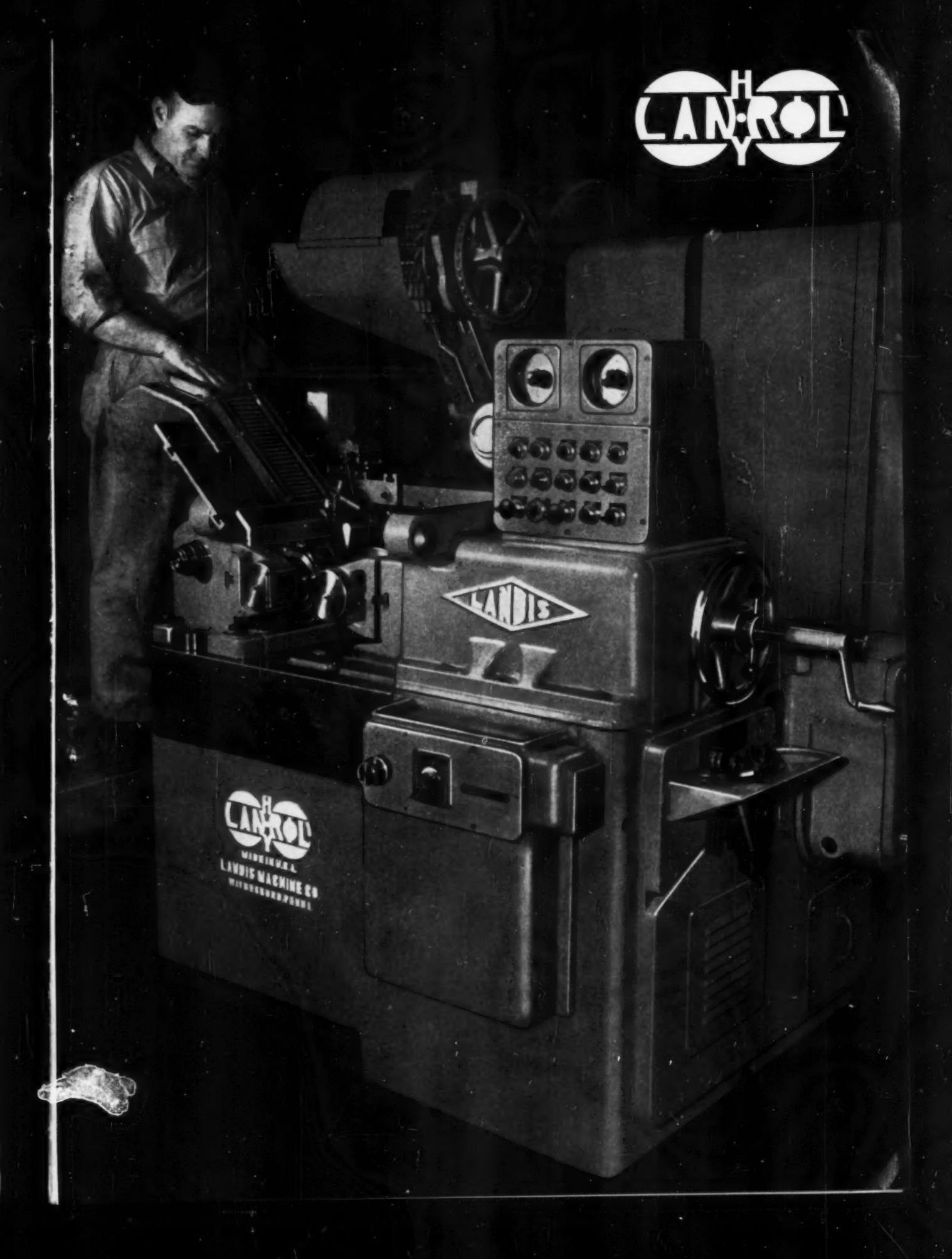
511C

LANDIS *Machine* COMPANY
WAYNESBORO • PENNSYLVANIA • U. S. A.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT • CUTTING • TAPPING • GRINDING • ROLLING

CIRCLE 176 READER SERVICE CARD

CIRCLE 177 READER SERVICE CARD ►


H
LAN-ROL
LANDIS
H
LAN-ROL
LANDIS MACHINE CO

LANDIS
micro

feed

automatically cancels all variables affecting work size

MICROFEED is the most notable advance in precision grinding accuracy in years. New Landis grinders with MICROFEED will produce parts to extremely close tolerances regardless of machine temperature variations, wheel wear, wheel pressure changes and work variations.

Precision to your tolerances on a production basis is assured, automatically.

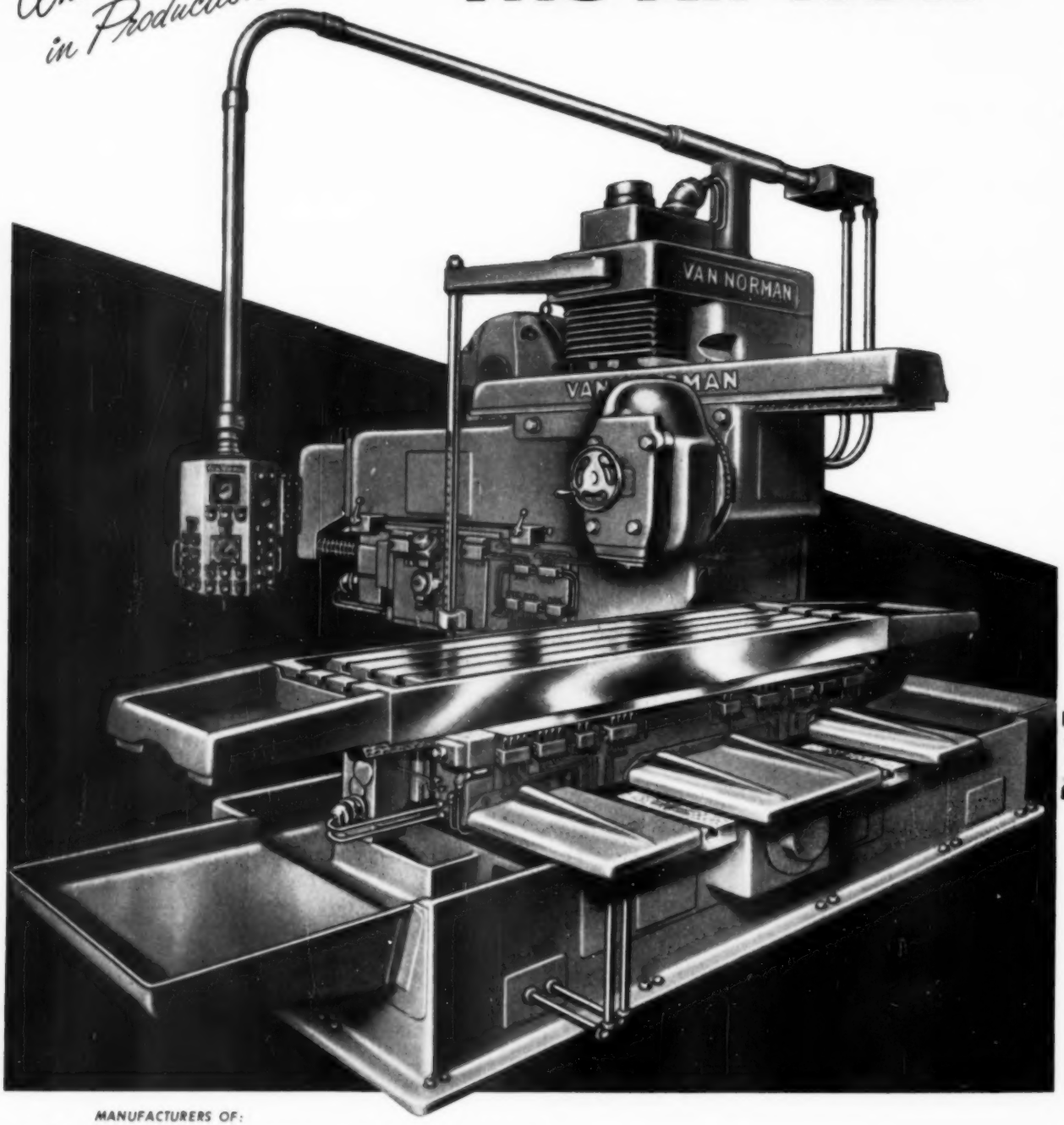
LANDIS

precision grinders

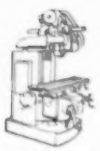
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

What's New Newest in Production Millers?

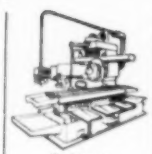
The All-New

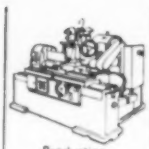


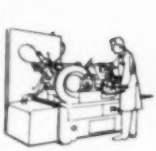
MANUFACTURERS OF:


Milling Machines

Standard Cylindrical Grinders


Bed-type Mills


Production Grinders


Centerless Grinders

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS

Van Norman 746
VERSI-MATIC

- **Designed and built for modern production**
- **Engineered for numerical control**
- **Offers maximum rigidity — accuracy — versatility — range — horsepower**
- **An 18-ton precision-built bed-type miller**
- **Also available without saddle**

Here it is — the newest thing in production millers — just the machine to cut or shape all of the new, tough super alloys while still maintaining exacting tolerances. *And* the 746 retains all the famous Van Norman quality features including the exclusive Van Norman 4-way cutterhead.

Examine closely the detailed specs of this newest Van Norman production miller. Then contact your nearest Van Norman dealer or write directly to Springfield.

We'll be glad to show you how the 746 Versi-Matic can fit into *your* production line.

SPECIFICATIONS

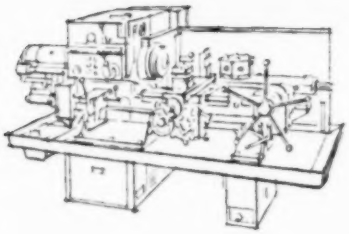
NO. 746 VERSI-MATIC VAN NORMAN SADDLE BED TYPE MILLING MACHINE
NO. 796 VAN NORMAN BED TYPE MILLING MACHINES

		746 with Saddle	A.I.A.* Med. Size	796 without Saddle
TABLE SIZE	Length	96"	94"	108" also 130"
	Width	24"	20"	30"
	T-Slots (3)	1 1/16"	1 1/16"	1 1/16"
POWER FEED TRAVEL	Longitudinal	50"	50"	72" also 108"
	Transverse (Saddle)	14"	14"	–
	Transverse (Ram)	44"	–	44"
	Vertical	35"	20"	48"
CLEARANCE MAX.	Spindle to Table (Horiz.)	35"	20"	48"
	Spindle to Table (Vert.)	22"	–	35"
	Cutter Dia.	16"	16"	16"
POWER FEEDS IPM	Longitudinal (Table)	1/8-90	1/8-90	1/8-90
	Transverse (Saddle)	1/8-90	1/8-90	1/8-90
	Transverse (Ram)	1/16-45	–	1/16-45
	Vertical	1/16-45	1/16-45	1/16-45
	No. Steps	Inf.	32	Inf.
	Rapid Traverse (Table & Saddle)	150	150	150 (table only)
	Rapid Traverse (Vert. & Ram)	75	–	75
SPINDLE	Horsepower	25 50	25 50	25 50
	R.P.M.	15-1500	15-1500	15-1500
	No. Steps	18	16	18
	Head Swivels	120° (30° by vert.)	–	120° (30° by vert.)
	Taper	ASA 50	ASA 50	ASA 50
	Flange	ASA 60	ASA 60	ASA 60
WEIGHT	Net approximately	37,000 lbs.	–	41,000 lbs.

*Aircraft Industries Association NAS-909 Specifications.

MACHINE COMPANY
A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export..



If you

were a turret lathe operator today,

wouldn't **you** *want*

to work at a machine

with this easy method

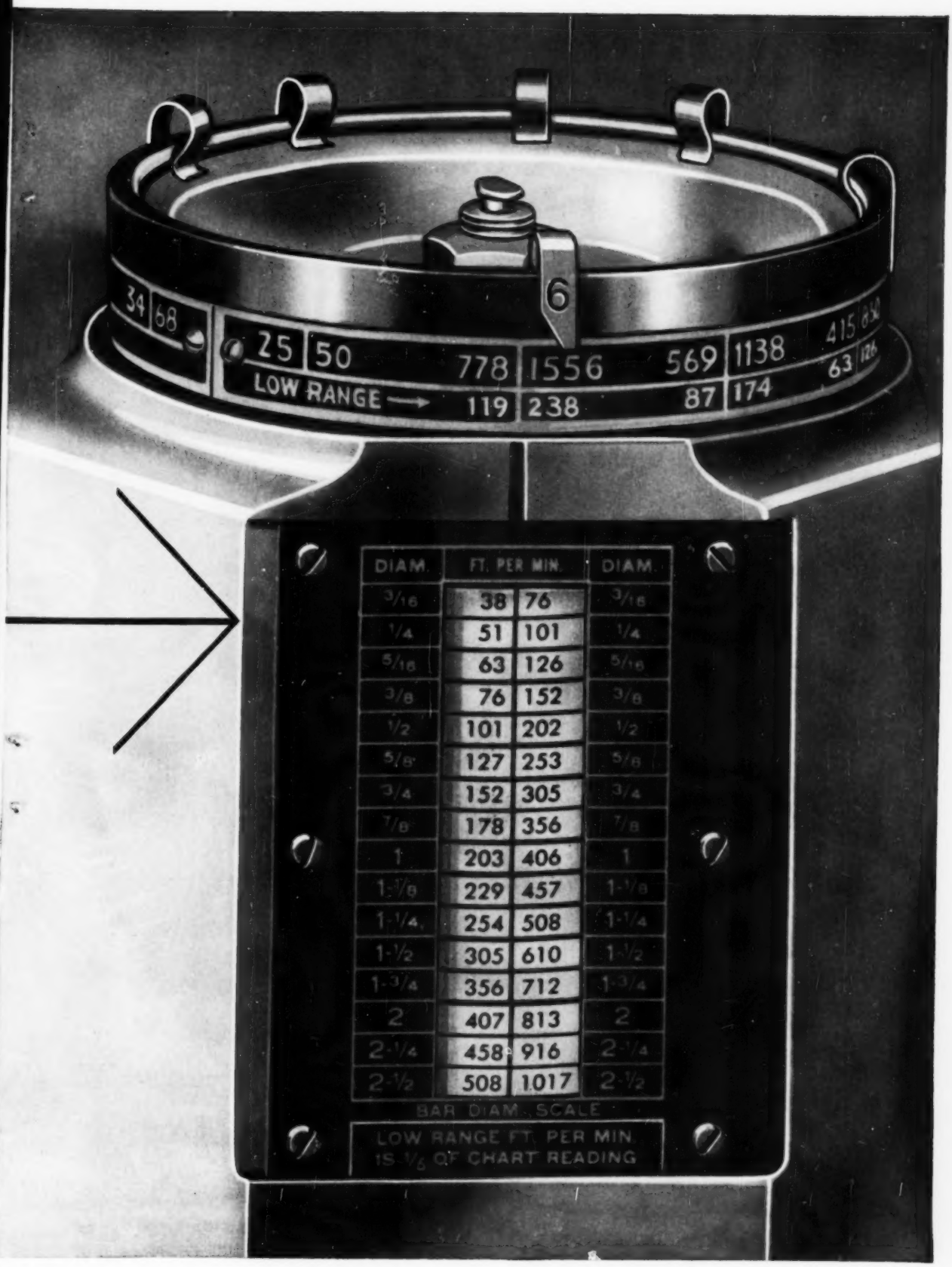
of preselection?

Only Warner & Swasey offers this direct-reading speed selector calibrated in work diameter, surface feet, and spindle rpm's—thus, no slide rules or conversion charts are required to determine proper spindle speeds. Movable number clips indicate at a glance your job's sequence of speed changes.

Ask your Warner & Swasey Field Engineer about this exclusive feature

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY


34 68
25 50 778 1556 569 1138 415 830
LOW RANGE → 119 238 87 174 63 126
6
DIAM. FT. PER MIN. DIAM.
3/16 38 76 3/16
1/4 51 101 1/4
5/16 63 126 5/16
3/8 76 152 3/8
1/2 101 202 1/2
5/8 127 253 5/8
3/4 152 305 3/4
7/8 178 356 7/8
1 203 406 1
1-1/8 229 457 1-1/8
1-1/4 254 508 1-1/4
1-1/2 305 610 1-1/2
1-3/4 356 712 1-3/4
2 407 813 2
2-1/4 458 916 2-1/4
2-1/2 508 1017 2-1/2
BAR DIAM. SCALE
LOW RANGE FT. PER MIN. IS 1/6 OF CHART READING

It takes a lot of Grit

to keep industry growing

Why production men are "flap" happy—

One of the bottlenecks in industry was spot removal and longitudinal polishing on such products as steel tubing, unusual extruded shapes, edges on flush door panels.

From the research laboratories of Behr-Manning and their "Abrasive Tech" engineers came the answer—"flap" wheels. Ingeniously designed and made from multiple sheets of cloth coated abrasive, this newest production tool can speed-finish products better and faster than ever before—for less.

The leadership and over 302 major product improvements in coated abrasives and tapes by Behr-Manning can be attributed to their unrivaled research laboratories, vast manufacturing facilities . . . and their never-ending search for ways to speed production, improve products, and lower costs. Behr-Manning takes pride in being an important supplier of vital production tools to countless industries and homes.

In one year, Behr-Manning makes more than 180,000,000 sheets of sandpaper and over 20,000,000 abrasive belts – plus millions of discs, rolls, and other coated abrasive specialties.

The sign of the Bear means a better product . . . and better production

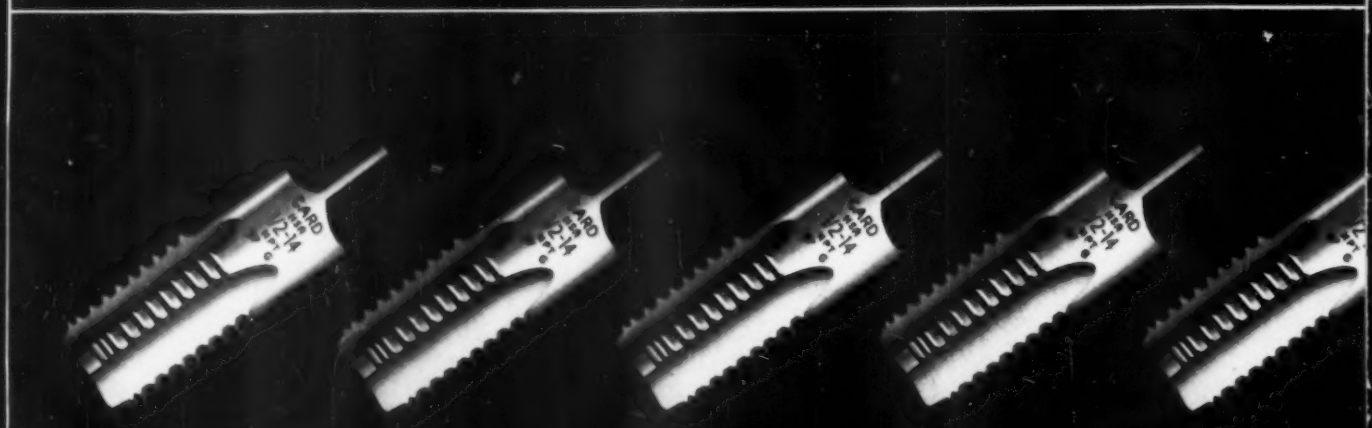
BEHR-MANNING CO.

TROY, NEW YORK – A DIVISION OF NORTON COMPANY

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals
In Canada: Behr-Manning (Canada) Ltd., Brantford For Export: Norton Behr-Manning Overseas Inc., Troy, N. Y., U.S.A.

NORTON ABRASIVES

When you see uniformity, remember...



With Card pipe taps you get uniformity

Your production's consistent ...because Card taps are uniform

. . . And they keep your cutting costs low. Designed to meet today's high production demands, Card pipe taps assure you maximum output on every run. In addition, their long-wearing qualities mean you don't have to maintain a large investment in replacements. Your Card technical man can apply all the cost-cutting advantages of Card taps to your production. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

CIRCLE 186 READER SERVICE CARD

If you use cutters as much as steel mills use ore . . .

Ordering Union cutters will cut your production time and costs

The more you use cutters the more you need Union

In addition to Union's full line of standard milling cutters, Union is prepared to lay out and design cutters singly or in gangs, for all your milling operations. In addition, Union technical men are showing plants throughout the country how production time and costs can be cut with solid milling and gear cutters, inserted blade cutters, drills, end mills, reamers, hobs and carbide tools. **Available nationally through Union Distributors** and stocked in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

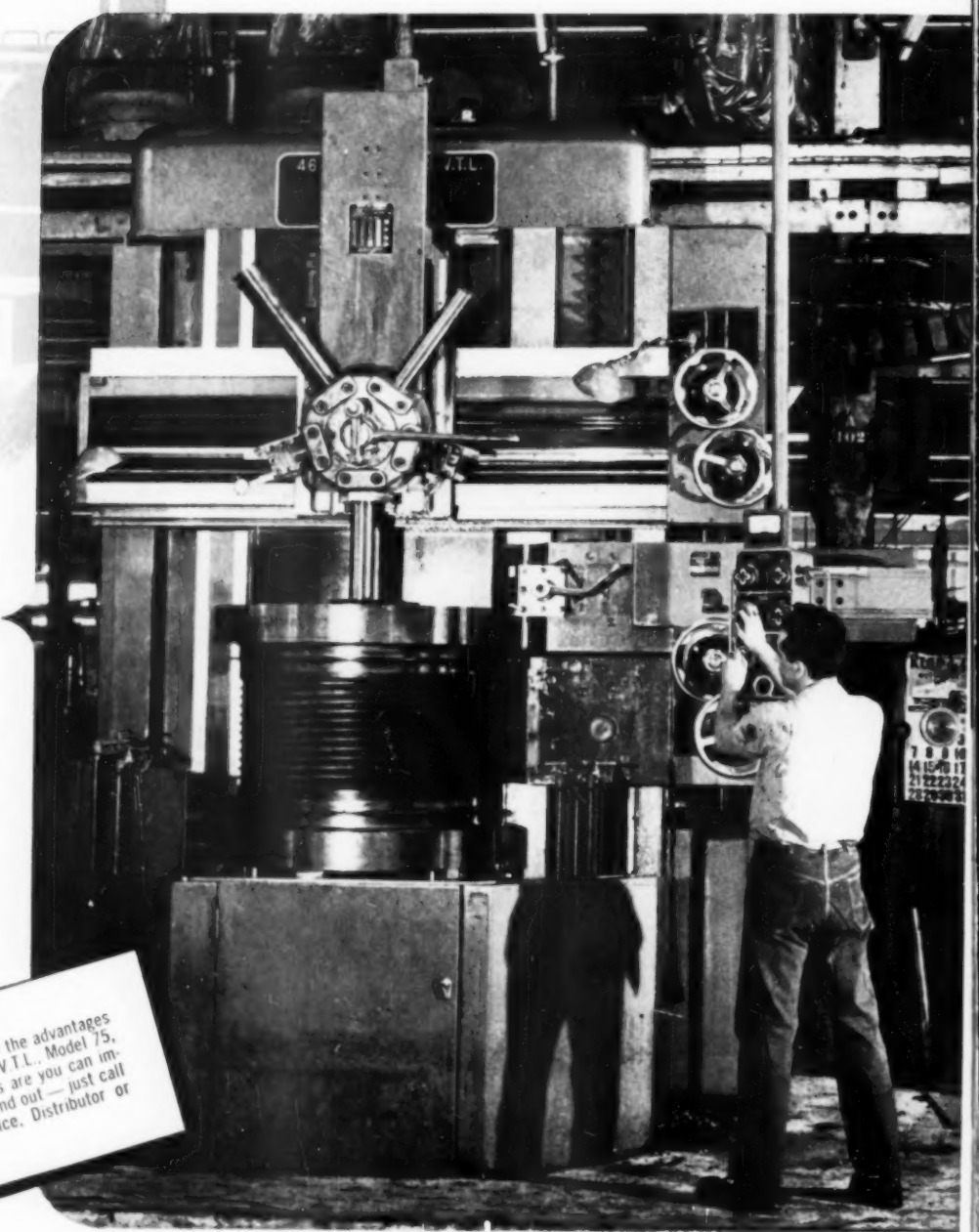
S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

CIRCLE 187 READER SERVICE CARD

It Pays To Replace

An analysis of cost records at Philadelphia Gear Corporation, Philadelphia, Pa., shows, according to Mr. John Walker, Shop Foreman,

"A savings of up to 30% in overall production over our older 42" Bullard V.T.L. with our 46" Cut Master V.T.L., Model 75."



This saving is accredited to the following built-in features of Cut Master, Model 75:

Greater rigidity and solid construction – allows heavier cuts.

Greater accuracy with accurate finishes – reduces spoilage.

Simultaneous cutting with turret and side head – reduces machining time.

Ease of operation with Pendant Control – reduces operator fatigue.

Low maintenance cost – less down time.

One shot lubrication system – assures adequate oil to all parts of the machine.

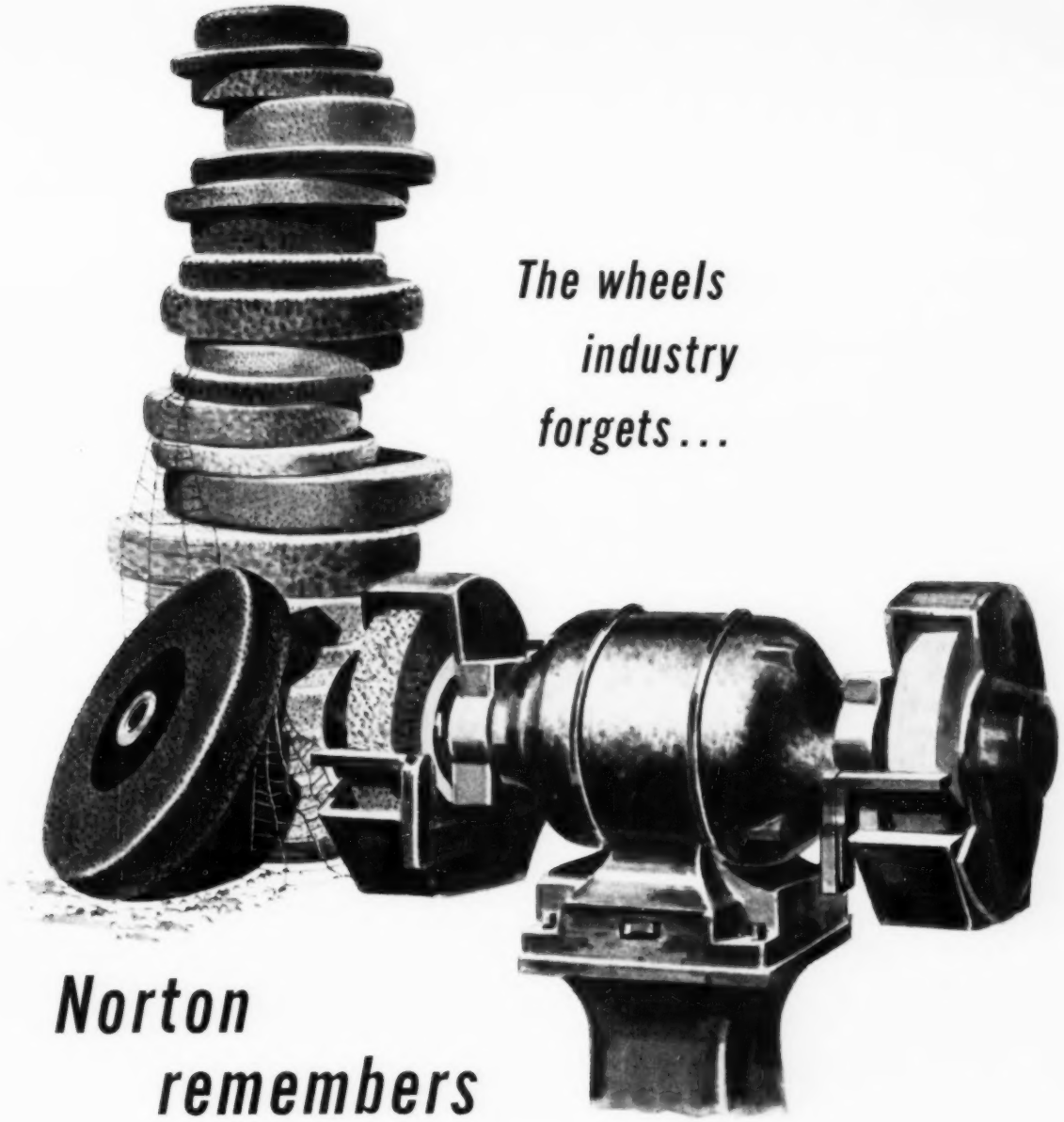
BULLARD

Unless you are now employing all of the advantages offered with a Bullard Cut Master V.T.L., Model 75, to your machining jobs — chances are you can improve your production. Why not find out — just call your nearest Bullard Sales Office, Distributor or write

4,000 pound Drum for gate hoist which is bored, faced and turned on 46" Bullard Cut Master V.T.L., Model 75.

THE BULLARD COMPANY BRIDGEPORT 9, CONN.

CIRCLE 188 READER SERVICE CARD



The wheels industry forgets...

Norton remembers

Industry never gives general purpose grinding wheels enough thought . . . forgets that, thanks to all-around usefulness, g.p.'s deserve as much care in selection as special purpose wheels.

They deserve the same care in manufacture, too — and Norton has always remembered to give them exactly that. General purpose wheels of 44 ALUNDUM* abrasive, vitrified bonded, are among the newest Norton developments. Like all Norton wheels they're made of virgin abrasive to precision limits . . . in the newest, most modern abrasive plant . . . with the same thorough control of processing and speed-testing for safety.

For *your* benefit, this manufacturing care provides wheel balance, uniformity of structure and freedom from soft spots that result in free-cutting action throughout each wheel's entire life.

Worth remembering to make, 44 ALUNDUM general purpose wheels are worth remembering to order. With huge stocks in Norton warehouses and plants to draw from, Norton Distributors everywhere keep full stocks for prompt deliveries. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade Mark Reg. U.S. Pat. Off. and Foreign Countries

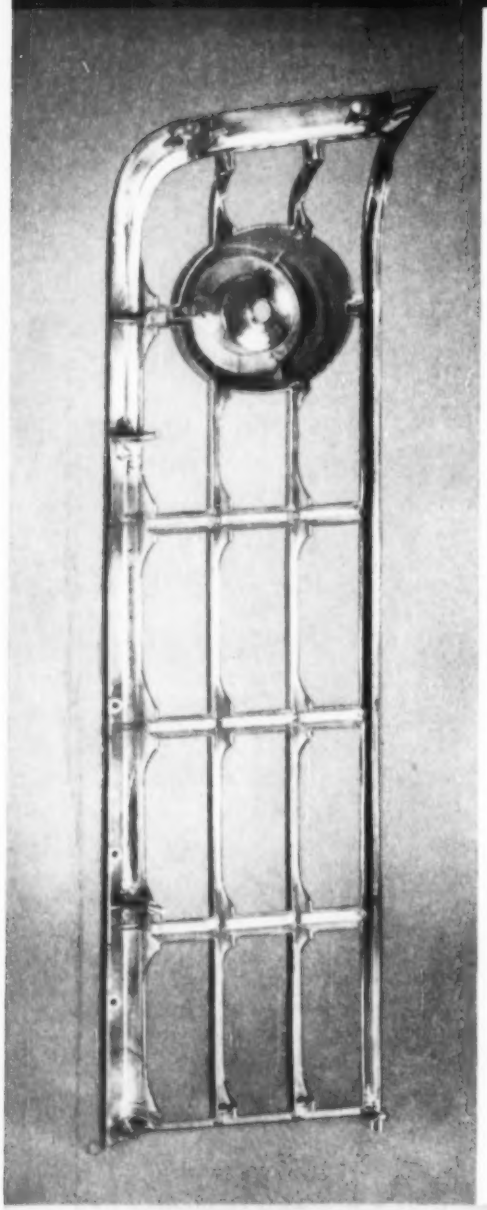
NORTON
ABRASIVES

W-1927

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

IT'S LIGHTER THAN YOU THINK!



...AND MAKES A STRONGER GRILLE WHEN DIE CAST with ZAMAK

Each half of this substantial 1959 RAMBLER grille is made of a single light-weight zinc die casting—for strength and rigidity—with long-lasting chromium plating.

Complete with integrally cast lamp housings and mounting studs for rapid assembly, the grille on this popular American Motors automobile is designed for appearance, durability and economy.

As in many other applications, rugged but extremely thin wall sections—possible only with ZINC die castings—minimize weight and are stronger **in proportion to thickness** than heavier sections.

Parts designed for ZAMAK alloy die casting will meet competition of either stampings or aluminum castings—and at lower cost.

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street • New York 38, N. Y.

HORSE HEAD PRODUCTS

news for users of precision surface grinders

LANDIS TOOL ACQUIRES LINE OF SURFACE GRINDING MACHINES

Takes over line of
ABRASIVE MACHINE TOOL COMPANY
East Providence, Rhode Island

To this leading line of surface grinders will be added over 60 years of experience in developing, designing and manufacturing precision grinding machinery.

For literature or quotations on any of the precision surface grinders in the abrasive line, consult your present Abrasive distributor, or write to Landis Tool Company, Waynesboro, Pennsylvania.

ABRASIVE
precision surface grinders

a product of
LANDIS TOOL
world's largest manufacturer of precision grinding machinery

50% MORE TERMINALS IN THE SAME SPACE!

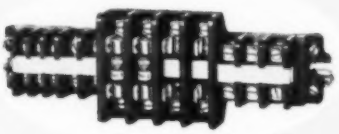
SQUARE D's *NEW* TERMINAL BLOCKS

MORE FLEXIBILITY, TOO!

NOTICE *(above)* how little space is required to remove or add a Square D channel-mounted terminal block to the completely assembled unit. Especially important for a quick change when an additional terminal must be inserted into grouping.

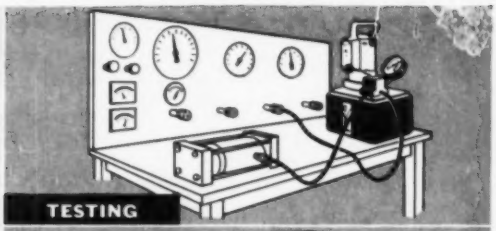
LOOK *(at right)*... all sizes can be mounted on same channel...25 ampere pressure wire connectors, 25 to 50 ampere box lugs ...all can be interlocked together. Terminals in kit form to "do-it-yourself" or factory-assembled to standard specifications.

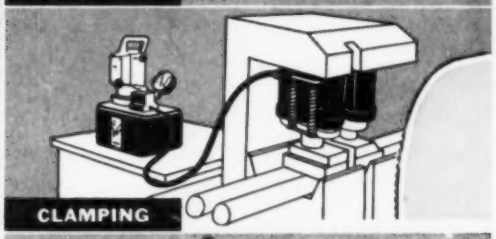
NEW...**fusible terminal block** *(below)* for protection of solenoids and other single or three-phase loads. Mounts on same channel as regular terminal blocks. Available factory-assembled or in kit form for customer assembly.

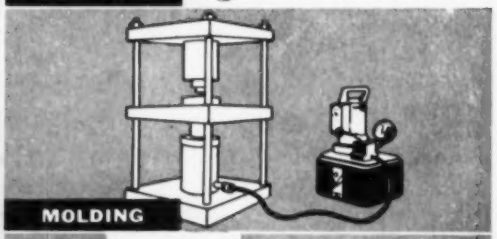


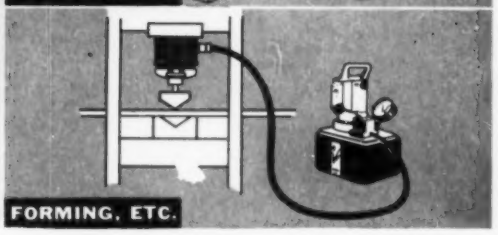
ASK YOUR SQUARE D FIELD ENGINEER
or write for Bulletin which covers details on Channel-Mounted Terminal Blocks. Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

SQUARE D COMPANY

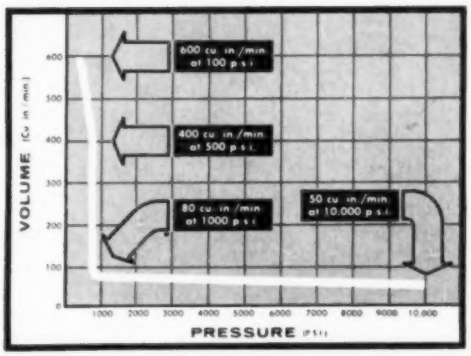








3½ Times Faster ram approach and return!—with new OTC two-stage, hi-pressure hydraulic pump!



- **DELIVERS FROM 2.6 G.P.M. @ 100 P.S.I. TO 50 CU. IN. MIN. @ 10,000 P.S.I.!**
- **COMPACT: WEIGHS ONLY 45 LBS.; ONLY 17½" HIGH!**

Imagine—the time you can save! . . when your rams move to and from the work 3½ times faster. That's what you save with the new OTC "Vanguard" complete pumping unit, as compared to any other single two-stage, hi-pressure unit of comparable size.

All wearing parts are made of finest tool steel, heat-treated and ground and lapped to assure efficiency and long life!

A variety of valves, controls and accessories are available.

Here is a new and revolutionary product! Your interest, in reading this far, is well founded! Now get the complete story:

For bulletin and complete information, write:

RESEARCH · ENGINEERING · DEVELOPMENT

OTC

PRECISION HYDRAULICS DIVISION

OWATONNA TOOL COMPANY

512 CEDAR STREET, OWATONNA, MINNESOTA

CIRCLE 193 READER SERVICE CARD

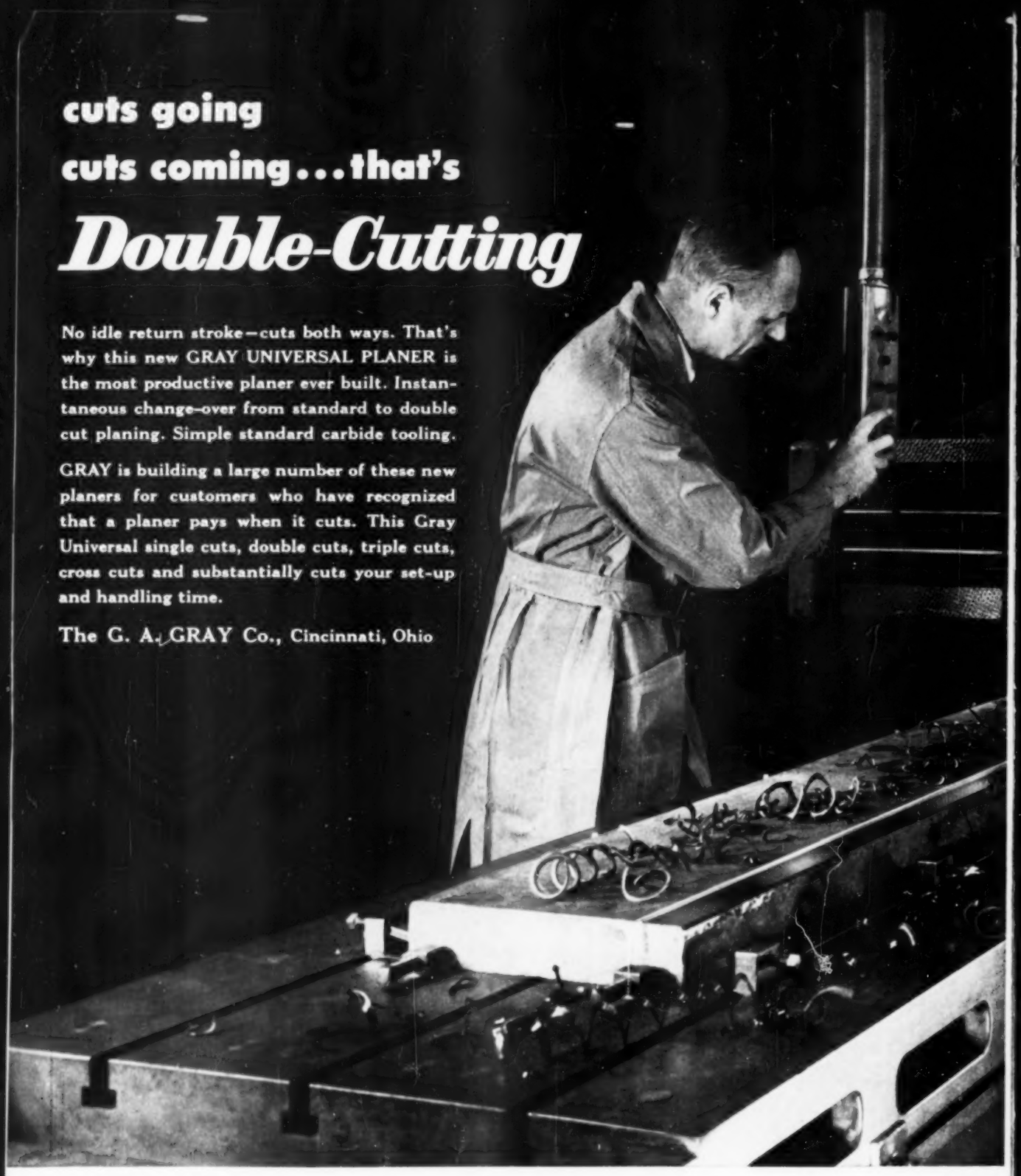
CIRCLE 194 READER SERVICE CARD ►

cuts going
cuts coming...that's
Double-Cutting

No idle return stroke—cuts both ways. That's why this new GRAY UNIVERSAL PLANER is the most productive planer ever built. Instantaneous change-over from standard to double cut planing. Simple standard carbide tooling.

GRAY is building a large number of these new planers for customers who have recognized that a planer pays when it cuts. This Gray Universal single cuts, double cuts, triple cuts, cross cuts and substantially cuts your set-up and handling time.

The G. A. GRAY Co., Cincinnati, Ohio

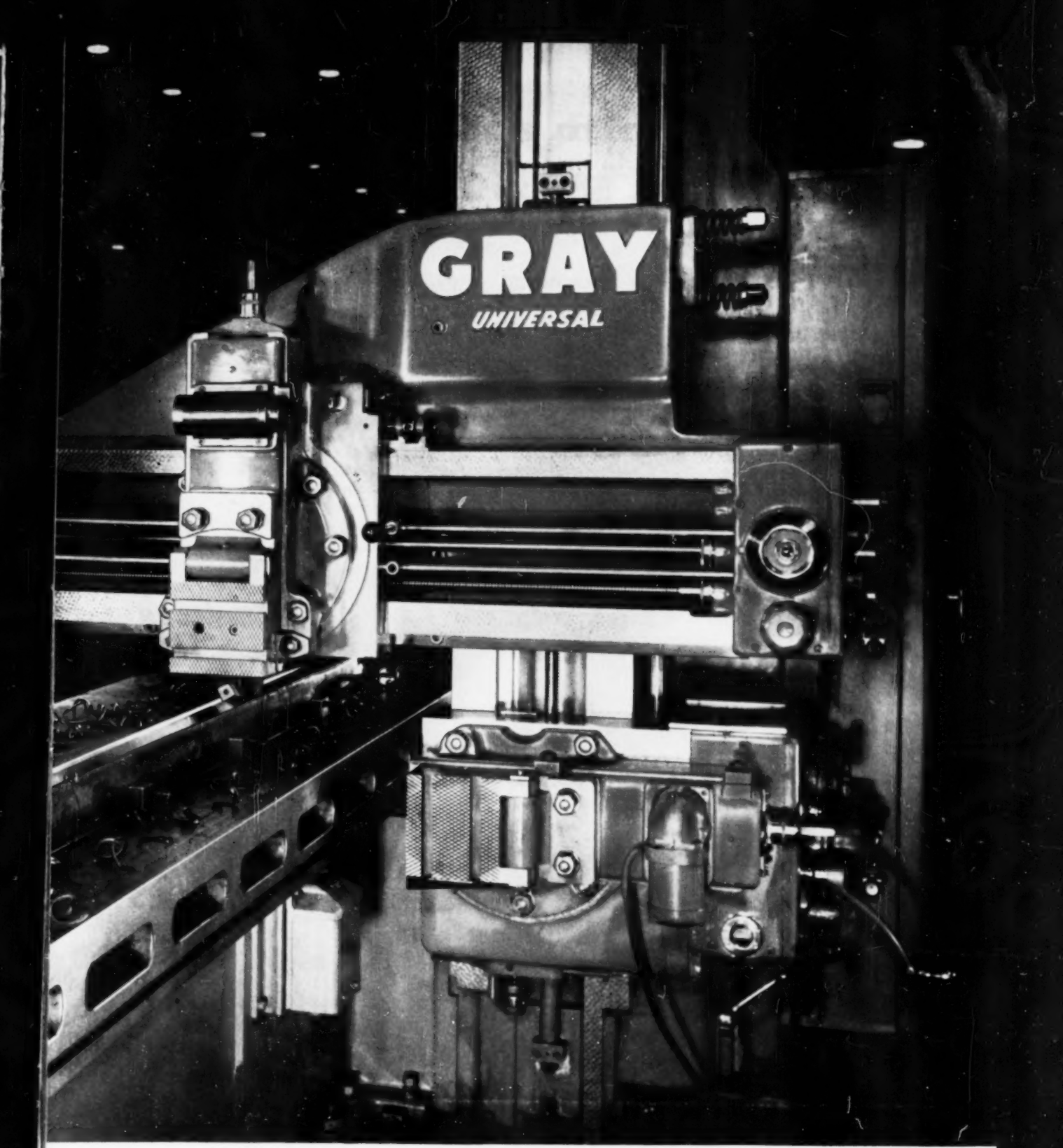


heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

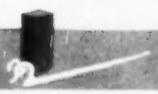
double cut planing

The flick of a lever, the touch of a button permits double cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.



triple cut planing

Rough and rough-finish plane at the same time. Rough by double cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.



cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

Don Chisholm solved a double problem at Split Ballbearing . . .

It all started with a torque tube bearing for one of the top priority missile guidance systems. Two kinds of trouble had developed during the manufacturing process and engineers at the Split Ballbearing Division of Miniature Precision Bearings, Inc., Lebanon, N. H., were in a hurry to get both of them straightened out.

First, in bore-grinding the inner race, about .010" of stock had to be removed, but the tolerance specified was a microscopic ±.0001 and an eight microinch finish was mandatory. The bore-grinding wheel used wasn't up to requirements and the reject rate was excessive.

Second, in lapping the faces of both races, the wheels used were not producing the required five microinch finish, there was an imbalance between the amount of stock removed from the upper and lower surfaces . . . and, on top of that, the wheels themselves broke down too rapidly.

Bay State was called in and Abrasive Specialist Don Chisholm attacked the problem, working closely with Distributor Harold Domingue, Abrasives & Tools, Inc., Auburn, Mass. They not only cured both troubles and brought production up to the standards required . . . the people at Split Ballbearing were so delighted they asked Chisholm and Domingue to make a survey of every grinding operation in the plant. This led to fourteen other carefully considered recommendations.

Like Hal Domingue and Don Chisholm, the Bay State people in your area are trained specialists. Whether you have a single problem or a multitude of them, they're ready to apply experience, imagination and plain hard work. *Better grinding at lower cost . . . that is their business.*

Skill and experience play a vital part in maintaining the ultra-precise standards demanded by Split Ballbearing customers. Here, the company's senior machine operator, Emory Malloch, loads the fixture plate in the big production lapping machine with torque tube races.

Examining the precisely lapped finish on a pair of bearing races are Frank Orth (left), Chief Industrial Engineer at Split Ballbearing, and George R. Morin, Factory Manager.

◀ CIRCLE 195 READER SERVICE CARD

CIRCLE 196 READER SERVICE CARD

and they gave him 14 more!

Don Chisholm has built a formidable reputation for solving tricky abrasive problems. Prior to joining Bay State as an abrasive specialist, he spent 17 years as Abrasive & Tool Coordinator at General Electric's turbo-super-charger and jet engine plants where his experience was extremely varied since he had to use abrasives on unusual alloys as well as the general run of industrial metals.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.

CIRCLE 197 READER SERVICE CARD

CIRCLE 198 READER SERVICE CARD ►

AFTER 100 YEARS

The SPEEDICUT CHIPBREAKER

U.S.A. Patent No. 2769355

A NEW CONCEPT IN DRILLING

EXCLUSIVE ADVANTAGES OF THE SPEEDICUT CHIPBREAKER

- Advanced design and precision manufacture permit 50% to 400% higher feed rates.
- The Chipbreaker rib throughout the full length of the flutes gives added rigidity to greatly increase the number of holes drilled per regrind.
- The web is constant through the entire length of the flutes enabling deep hole penetration, up to 10 to 12 times drill diameter, without withdrawal.
- Chip control permits coolant to flow more freely to the point of the drill giving improved heat dissipation and drilling performance.
- Speedicut Chipbreaker eliminates all long spiral chips which are both inconvenient and dangerous to the operator.
- No special grinding required–reduces down time and sharpening costs.
- Designed for all-purpose application – drills all types of metals.
- Developed by one of the world's most experienced cutting tool manufacturers.
- Sold at standard prices and stocked as standard item by carefully selected cutting tool distributors throughout the country.

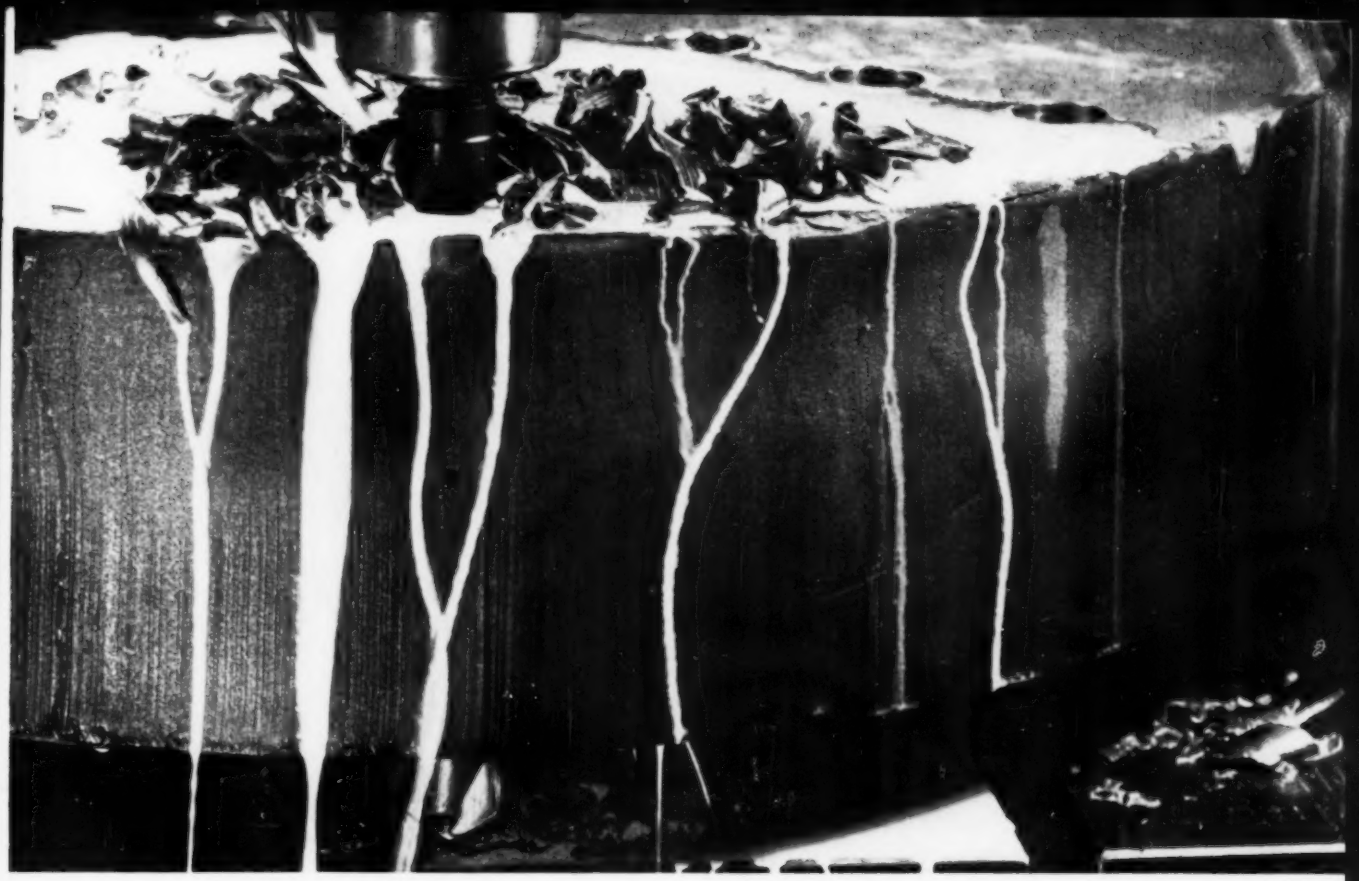
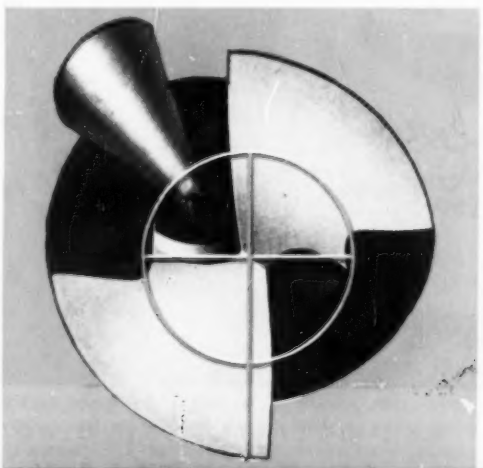


Photo shows 15/16" Speedicut Chipbreaker after drilling through 6" 1045 steel. In each operation, the drill was sunk to the full depth of the flutes *without withdrawal*, in 50 seconds. Drill feed was .027" per revolution with a drill speed of 270 rpm on a 4' radial—5 hp drill press.

SPECIFY SPEEDICUT CHIPBREAKER ...SPEED WITH SAFETY

Have demonstration in your plant

Fill in the form below to have your local authorized Speedicut Chipbreaker distributor arrange for a demonstration in your plant at your convenience.



THE PATENTED RIB that cannot be duplicated

CHICAGO HEIGHTS STEEL CO.
CHICAGO HEIGHTS, ILLINOIS

Speedicut Division
CHICAGO HEIGHTS STEEL CO.
Chicago Heights, Illinois

Gentlemen:

☐ Please have distributor call for a demonstration appointment.

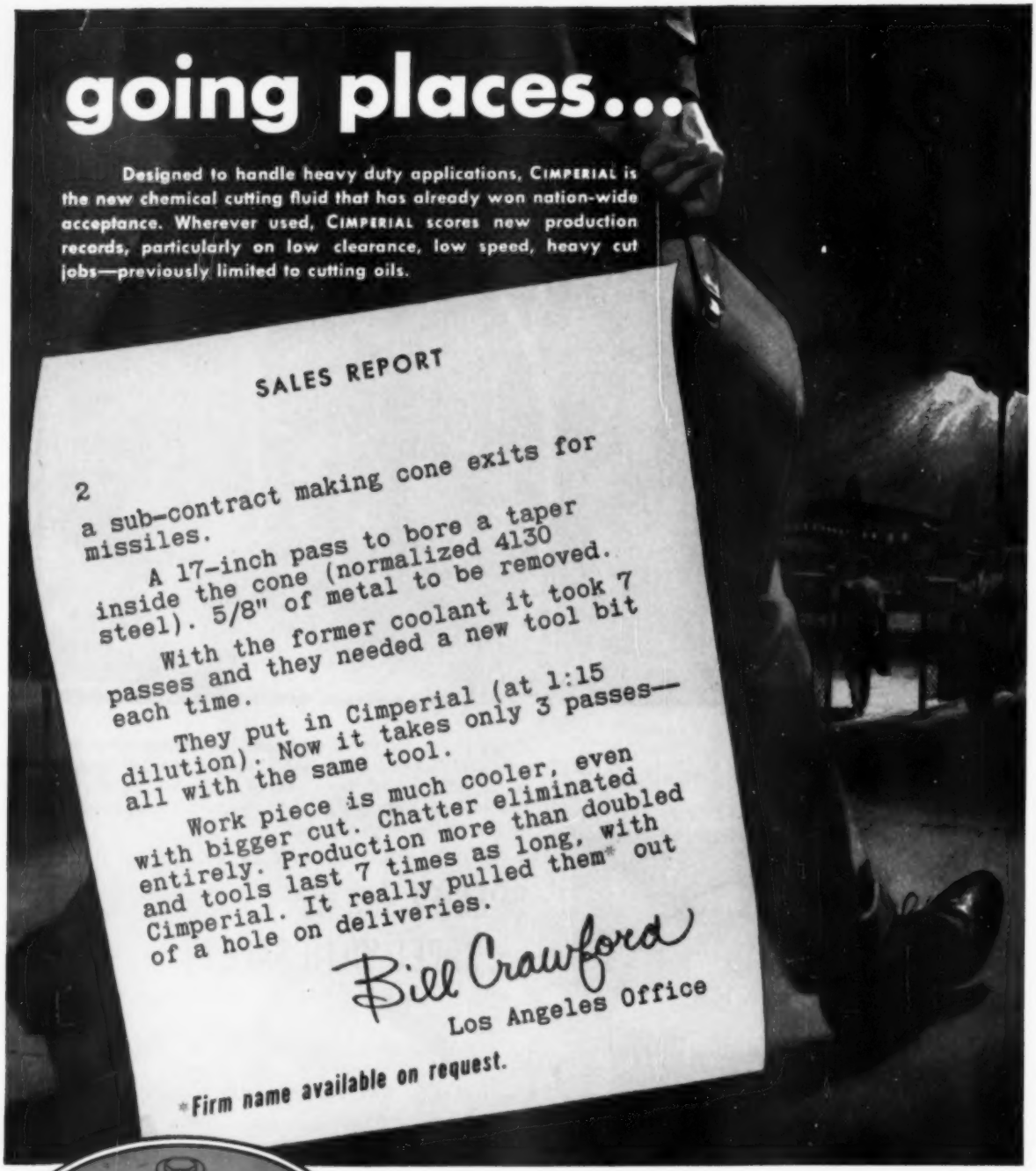
☐ Send literature on Speedicut Chipbreaker Drill.

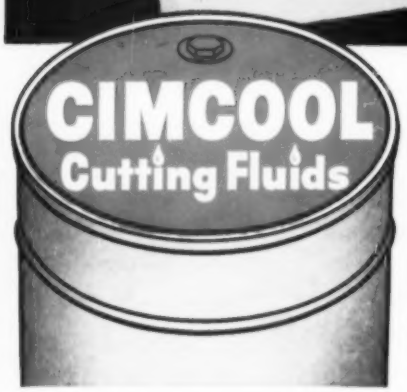
*Name*_____

*Company*_____ *Title*_____

*Address*_____

*City*_____ *Zone*____ *State*_____


going places...
Designed to handle heavy duty applications, CIMPERIAL is the new chemical cutting fluid that has already won nation-wide acceptance. Wherever used, CIMPERIAL scores new production records, particularly on low clearance, low speed, heavy cut jobs—previously limited to cutting oils.
SALES REPORT
2
a sub-contract making cone exits for missiles.
A 17-inch pass to bore a taper inside the cone (normalized 4130 steel). 5/8" of metal to be removed.
With the former coolant it took 7 passes and they needed a new tool bit each time.
They put in Cimperial (at 1:15 dilution). Now it takes only 3 passes—all with the same tool.
Work piece is much cooler, even with bigger cut. Chatter eliminated entirely. Production more than doubled and tools last 7 times as long, with Cimperial. It really pulled them* out of a hole on deliveries.
Bill Crawford
Los Angeles Office
*Firm name available on request.



FOR 100% OF ALL METAL CUTTING JOBS

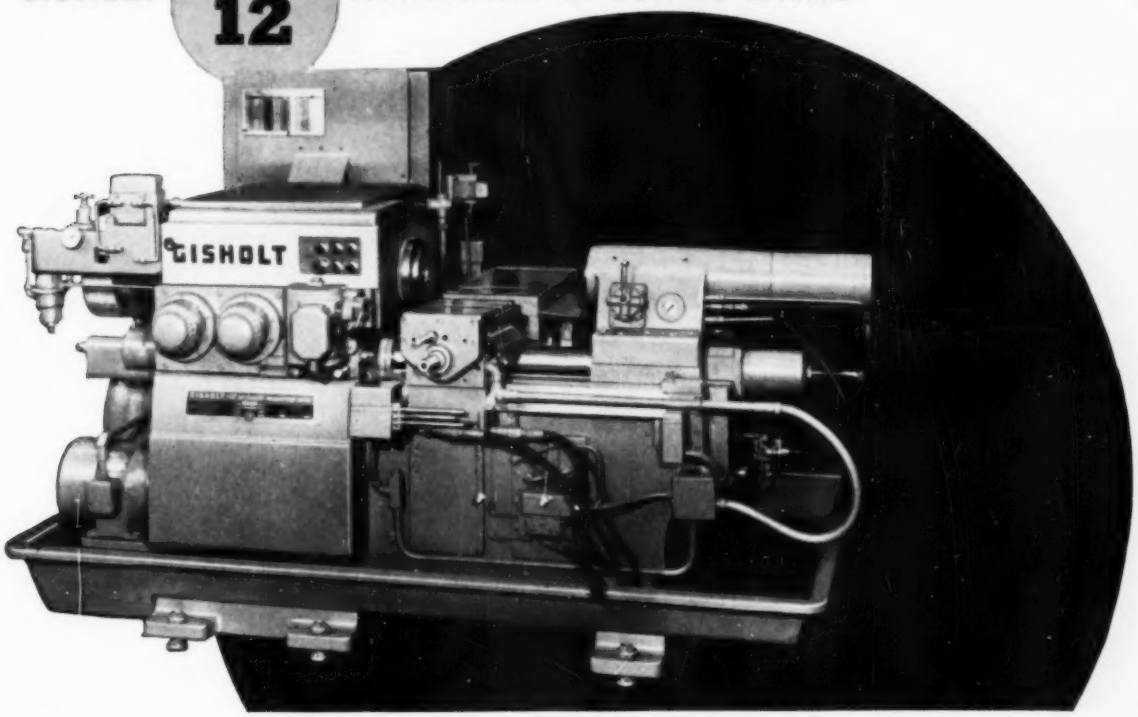
Production-proved products of The Cincinnati Milling Machine Co.

CIMPERIAL—newest in the famous, industry-proven line of CIMCOOL® Cutting Fluids!
CIMCOOL S2 Concentrate—The pink fluid which covers 85% of all metal cutting jobs.
CIMPLUS—The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS)—For every job requiring an oil-base cutting fluid.
ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

GISHOLT NUMBER 12 AUTOMATIC CHUCKING LATHE



Unequaled in its size range, in versatility, speed and low-cost production

Whether it's for continuous operation in mass production or a wide variety of parts in small lots, this machine is in a class by itself.

Faster automatic cycle. The No. 12 is a fully automatic chucking lathe, capable of performing all types of machining operations in rapid sequence. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it meets every requirement for stock removal, finish and minimum f.t.f. time.

Complete range of accessories. Front, rear, auxiliary and overhead slides can be applied; angular cuts are easily made; JETracer of single- or multiple-pass types can be used. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

Greater power and rigidity. Here, too, is the power (up to 40 h.p.) with rigidity to take full advantage of the newest tooling and the heaviest cuts without vibration.

Boosts operator productivity. It requires a minimum of operator skill and attention—allows him to handle additional machines.

With all its speed and ruggedness, the No. 12 has the extreme flexibility of motions to handle practically any machining job on parts up to 16½" in diameter. It delivers high production with consistent accuracy and less dependence than ever on operator skill.

Ask your Gisholt Representative or write for Bulletin 1213, just off the press.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• *Factory-Rebuilt Machines with New Machine Guarantee*

Put the bite on metal separating costs

Hold the metal separating line with Nicholson or Black Diamond Hacksaw and Band Saw Blades. We make blades to speed your work and hold the cost on almost every kind of industrial metal separating job. You'll see what this means when you try our blades. Your Nicholson or Black Diamond Blade Distributor will be glad to work closely with you. He'll help you choose the right blades for the job. Talk with him. The results of your talk may well lead to lower costs and improved results. Ask him, too, for the advantages in using our Precision Ground Flat Stock. He has money-saving data on this product.

Industrial Distributors provide the finest goods and services in the least possible time. We sell exclusively through them.

NICHOLSON

FILES • ROTARY BURS • HACKSAW AND BAND SAW BLADES • GROUND FLAT STOCK INDUSTRIAL HAMMERS

NICHOLSON FILE COMPANY, PROVIDENCE 1, RHODE ISLAND

NEW ROTOR "01" series air-powered DRILLS

World's most complete line matches your job exactly!

Available in ¼" to 7/16" capacity—choice of seven speeds, throttle handles, spindles, with or without chuck guard . . . hundreds of combinations to fit *your* job. Also available reversible for special applications.

"01" Series Drills have *all* the features that assure top performance and long life . . . proven by Rotor on thousands of jobs.

Compare for quietness, lightness, ease of handling, compactness. A free demonstration will be arranged in your plant. No obligation.

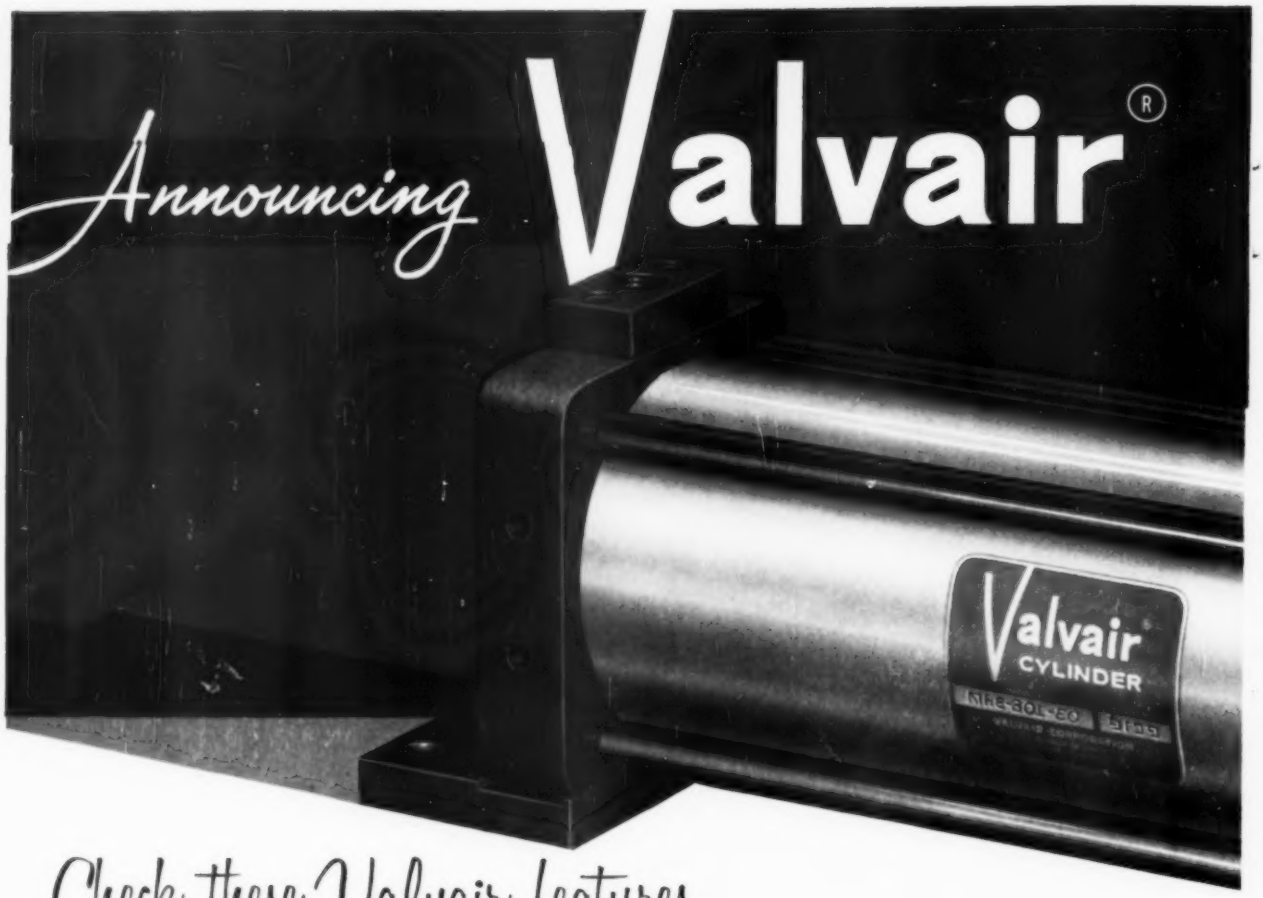
Here's the RIGHT TOOL for YOUR job!

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Special Tools • Air Motors

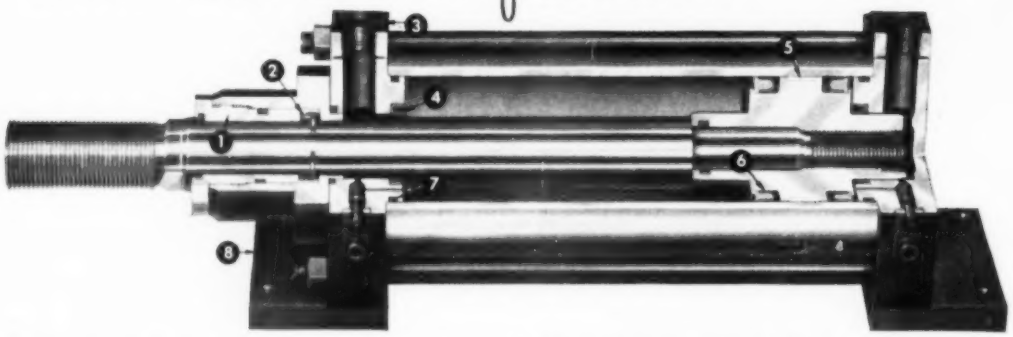
ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

Announcing Valvair®



Check these Valvair features...



1. **EXTRA-LONG NOSE GUIDE** provides maximum bearing area for piston rod . . . assures peak resistance to side-loading deflection of rod and piston.
2. **CARTRIDGE SEAL** assembly is designed for quick on-the-machine servicing . . . can be replaced without any disassembly of the cylinder.
3. **REMOVABLE PORT ADAPTERS** allow fast exchange of complete cylinder assemblies for bench servicing . . . time consuming piping operations are eliminated.
4. **SELF-ALIGNING CUSHION SEALS** assure uniform cushioning throughout cylinder life . . . unique one-way seal eliminates need for cushion ball check.
5. **TEFLON* WEAR STRIP** on piston prevents metal-to-metal contact between piston and bore . . . scuffing or scoring of bore surface cannot occur.
6. **NYLON-BACKED PISTON CUPS** for air service, or Teflon-backed O-rings for hydraulic applications, provide positive, bubble-tight sealing throughout the cylinder's operating pressure range . . . keeps break-loose pressures low.
7. **POSITIVE BARREL SEAL,** with full-width metal-to-metal contact between barrel and heads maintains leak-free sealing . . . holds dimensional stability under maximum stress.
8. **RE-USABLE MOUNTS,** with precision-fit load bearing slots, handle heaviest operating loads with ample safety factor . . . are easily changed for modification or re-use of cylinder.

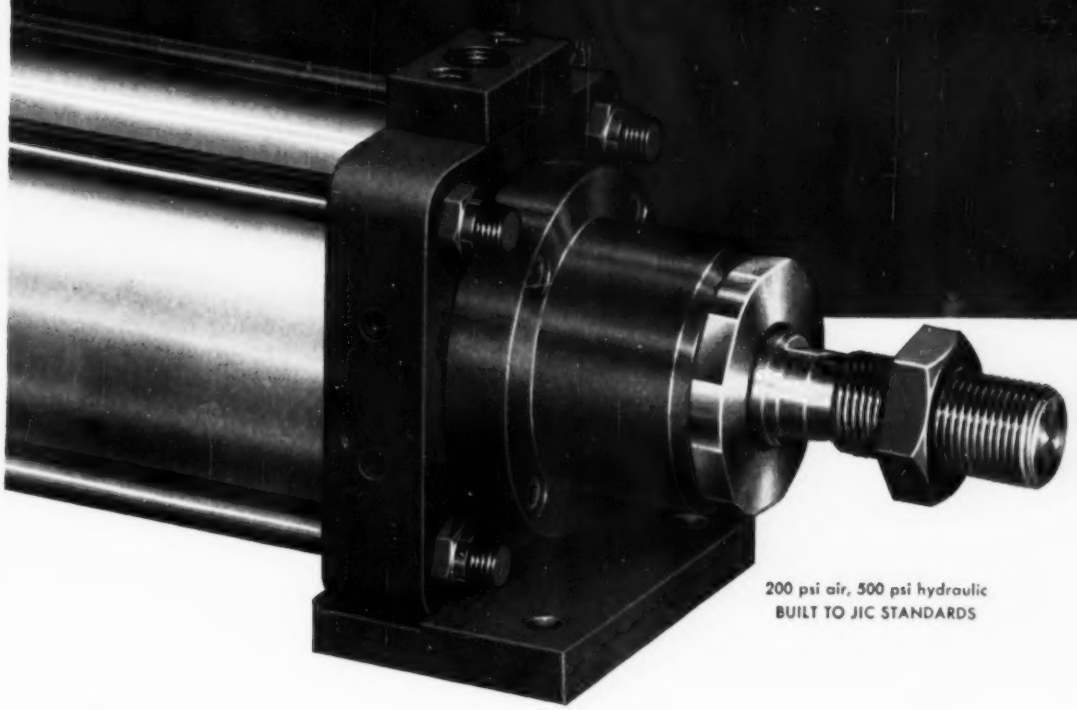
*Trade name for duPont tetrafluoroethylene resin

8029

VALVAIR AIR & HYDRAULIC CYLINDERS • SPEED KING CONTROL VALVES AND MANIFOLDS • PLUG-IN CONTROL VALVES AND MANIFOLDS

CIRCLE 204 READER SERVICE CARD

HEAVY-DUTY AIR AND HYDRAULIC CYLINDERS



200 psi air, 500 psi hydraulic
BUILT TO JIC STANDARDS

Here is a cylinder on which you can stake your reputation . . . built by Valvair, makers of famous SPEED KING control valves. With design features based on years of application engineering experience in high-production manufacturing operations, Valvair's new heavy-duty air and hydraulic cylinder offers performance, durability and ease of maintenance. Construction and component materials have been coordinated to assure efficient, trouble-free operation, plus longest service life with minimum machine downtime.

Built to JIC Standards and offering a full range of bore and rod sizes, interchangeable mounting styles, stroke lengths and cushioning options, you'll find Valvair heavy-duty cylinders ideal for your non-rotating cylinder applications. Take advantage of one-source responsibility for all your control system needs . . . cylinders, valves, manifolds, filters, regulators and lubricators . . . call in your nearby Valvair field engineer today.

For detailed information, write for Bulletin VC-800, Address Dept. AM759, Valvair Corporation, Akron 11, Ohio.

Offices in principal cities.

Valvair AKRON 11, OHIO

Other INDUSTRIAL DIVISIONS of IBEC: The Sinclair-Collins Valve Co. The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

• HI-SPEED INLINE VALVES • PILOT VALVES • MINI-KING VALVES • MANUAL VALVES • FILTERS • REGULATORS • LUBRICATORS

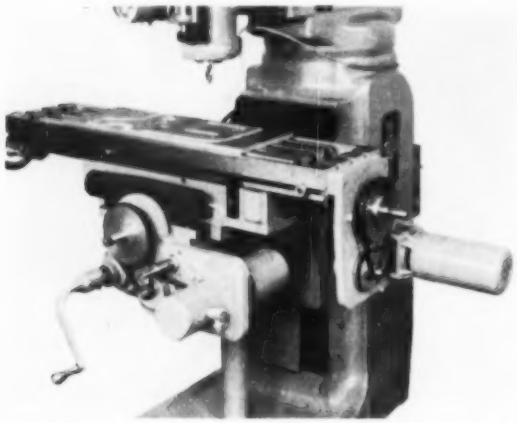
MICRO-PATH....

Automation System that

LISTENS to MAGNETIC TAPE

Micro-Path is a low-cost 3-axis control system for automating machine tools, industrial processes and similar screw, rack or shaft-driven equipment. It utilizes magnetic tape, operating on the record-playback principle, answering all commands as recorded with unerring accuracy.

LOW-COST—Micro-Path costs as little as ⅕ that of comparable systems. It requires no expensive computers, no mathematics; needs no director of operations, costly staff of technicians nor special programming department.



Illustrating simplicity of attaching Pulservo units to existing machines (guards removed). Three Pulservo units supply all horizontal and vertical feeds.

SIMPLE PROGRAMMING—On machine tool installations, such as illustrated, any skilled machinist can prepare his own program merely by recording a complete machining operation. Direct reading scales and other special controls simplify the task of staying "on blueprint" during the recording cycle. Playback of this tape accurately repeats the operation, duplicating the part. Programming may be carried on either at the controlled machine or at a different location with a special recording table. The magnetic tapes thus produced may be used on any similar machine to duplicate the part.

HIGH ACCURACY—On typical machining operations parts can be held to ±.001" of the drawing specifications with part-to-part repeatability within .00025". In many instances, economies can be shown when as few as 3 parts are machined.

EASILY ADAPTS TO EXISTING EQUIPMENT—With its modular unit construction Micro-Path is relatively easy to install on your present equipment, converting it to fully automatic operation with phenomenal increases in productivity, economy and freedom from human error. It is readily adaptable to milling machines, lathes, vertical boring mills, and other industrial equipment or process controls operated by shaft rotation.

WRITE FOR BROCHURE
Get the complete MICRO-PATH story now!
Ask for this new, illustrated brochure!

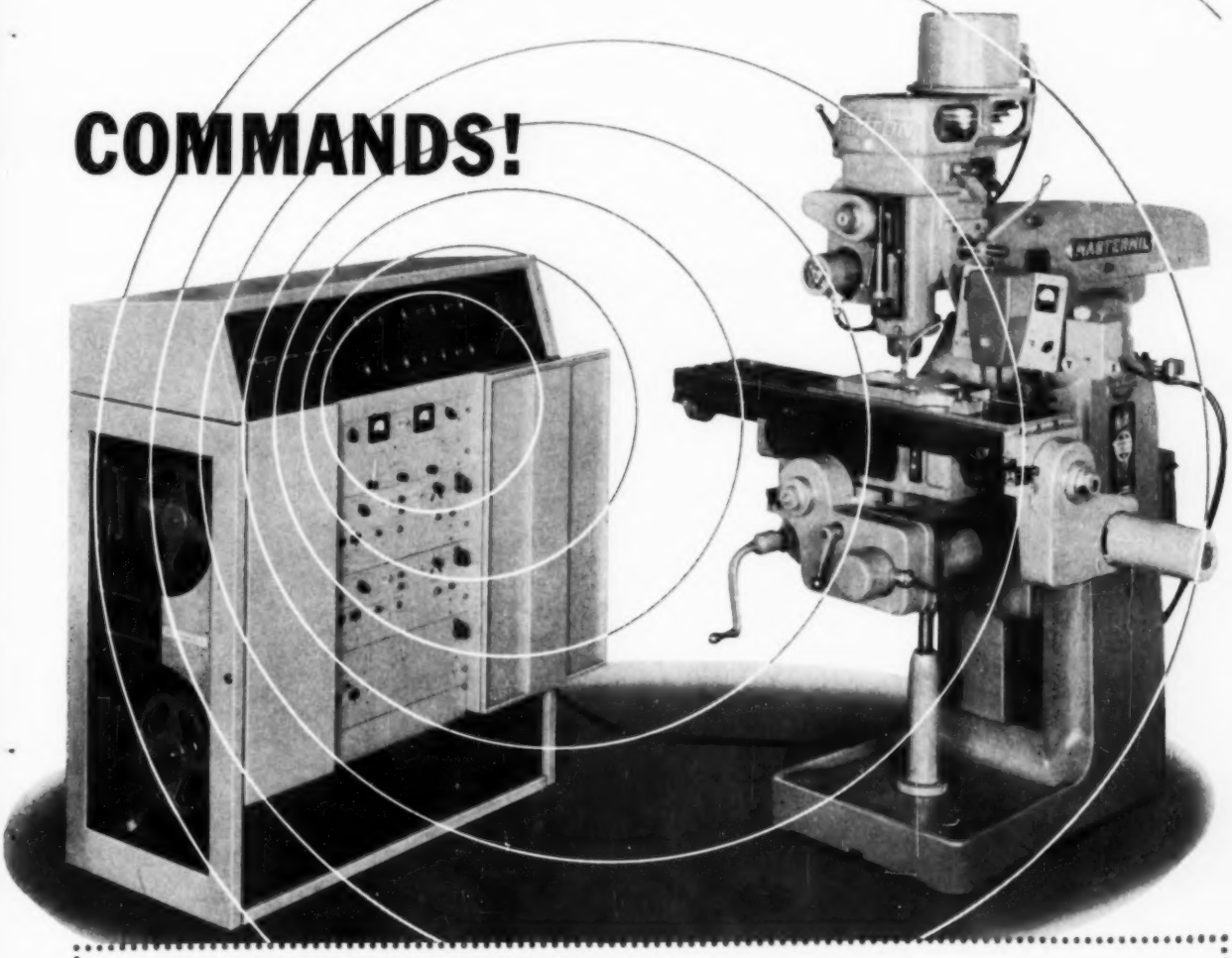
MICRO-PATH INC.

A Subsidiary of Topp Industries Inc.

4949 West 104th Street • Inglewood 2, Calif.
Phone: SPring 6-0450

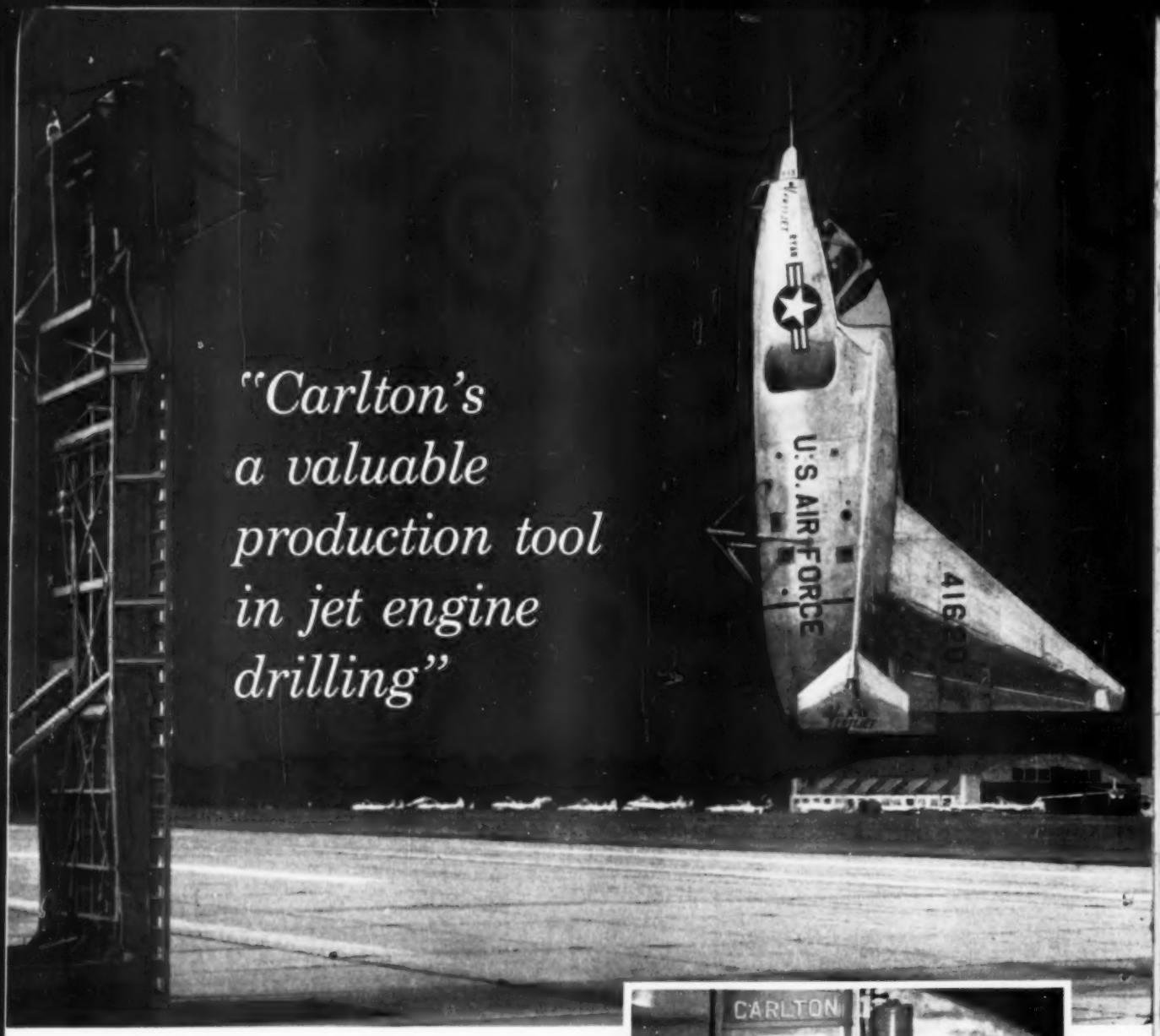
. . the Low-Cost 3-Axis

COMMANDS!



TYPICAL MICRO-PATH FEATURES

- Stylus recording control permits fast, direct programming.
- Adjustable, automatic electronic backlash removal ideally adapts Micro-Path to retrofit applications.
- Fully variable feed rate control permits optimum cutter loading for every operation.
- Programming is easily accomplished from over-size drawings.
- Electronic scale factor reduces recording errors.
- Programming at ¼ playback speed allows longer reflex and coordination time.
- An unlimited number of program functions are possible, such as spindle on-off, automatic clamping, coolant on-off, etc.
- Automatic program checking can be recorded in as many points as desired.
- Closed loop pulse-servo system insures complete accuracy in executing all commands.
- Extreme reliability of our design using simultaneous dual track recording of each motion command assures pulse response of 1 part in 1 billion—equivalent to .001" error in 15 miles of table travel!

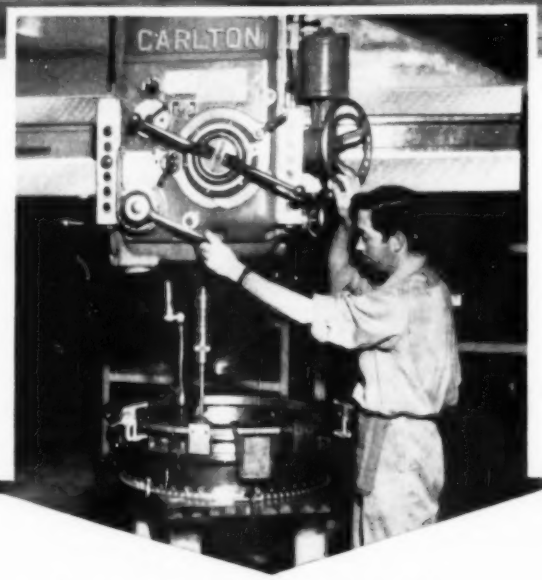


"Carlton's a valuable production tool in jet engine drilling"

Robert L. Clark, Works Manager, Ryan Aeronautical Co., San Diego, has supervised the production of hundreds of Ryan jet engine structures like the sensational Vertijet shown above. He says:

"Carlton is the kind of radial drill you can count on for production hole drilling like the jet engine H-ring (below)."

It will pay you to investigate Carlton radial drills for *all* your drilling and boring requirements. Unlimited choice of arm and column sizes and the most modern programming-preselect speed-feed control systems. Write for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton 3A Radial drills and reams 200 holes in the H-flange of this Ryan jet engine component.

Carlton ... *specialists in Radial Drills*

CIRCLE 208 READER SERVICE CARD

Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

How Allison Wheels help you get

Quick, accurate cuts on almost any material or shape

• Abrasive cutting can give you *cleaner* cuts, *faster*—on almost any material from titanium to fire brick. But only when you use the proper cut-off wheel can you get the best results. That's where your ALLISON-CAMPBELL Field Engineer can help. Show him your cut-off problem, and he can select the ALLISON wheel that will cut your metals and other hard materials at speeds of just a few seconds per square inch—fine finish, without burn and with little or no burr—accuracy within close tolerances.

No matter what cut-off problem you have, chances are the right ALLISON wheel will do the job more quickly, less expensively, and more accurately than any other cut-off method. There's a complete selection of ALLISON wheels for every abrasive cutting application.

• • •

Resinoid bonded wheels are designed specifically for dry abrasive cutting machines. They cut at rates of 3 to 5 seconds per square inch, will cut 2" x 2" hardened steel on a standard chop stroke machine in 16 seconds.

Rubber bonded wheels are used primarily for wet cutting operations to obtain the finest quality cuts on all types of steel, alloys, titanium, glass, and plastics. Rubber bonded wheels are sometimes used for cutting tubing dry with minimum burr.

Masonry cutting blades, including reinforced types, are available for both wet and dry cutting of such materials as fire brick, concrete block, glazed tile, and transite. Use of the proper ALLISON wheel can reduce down-time for furnace repairs by speeding the installation of refractory brick.

Fiberglass reinforced wheels provide high cutting speeds while giving extra strength for many foundry cutting jobs. They're available in both resinoid and rubber bonded types, help prevent accidents and costly breakage.

GET THE COMPLETE STORY! Write for **Bulletin DH-214** for detailed information on abrasive cutting techniques, and the wide selection of ALLISON wheel specifications. ALLISON wheels are available 3" to 34" diameter, .006" to 3/16" thick. And remember—your ALLISON-CAMPBELL Field Engineer can give you specialized help. His know-how is your assurance of the efficient, accurate, and economical cutting you can expect from modern abrasive cutting techniques.

ACCO

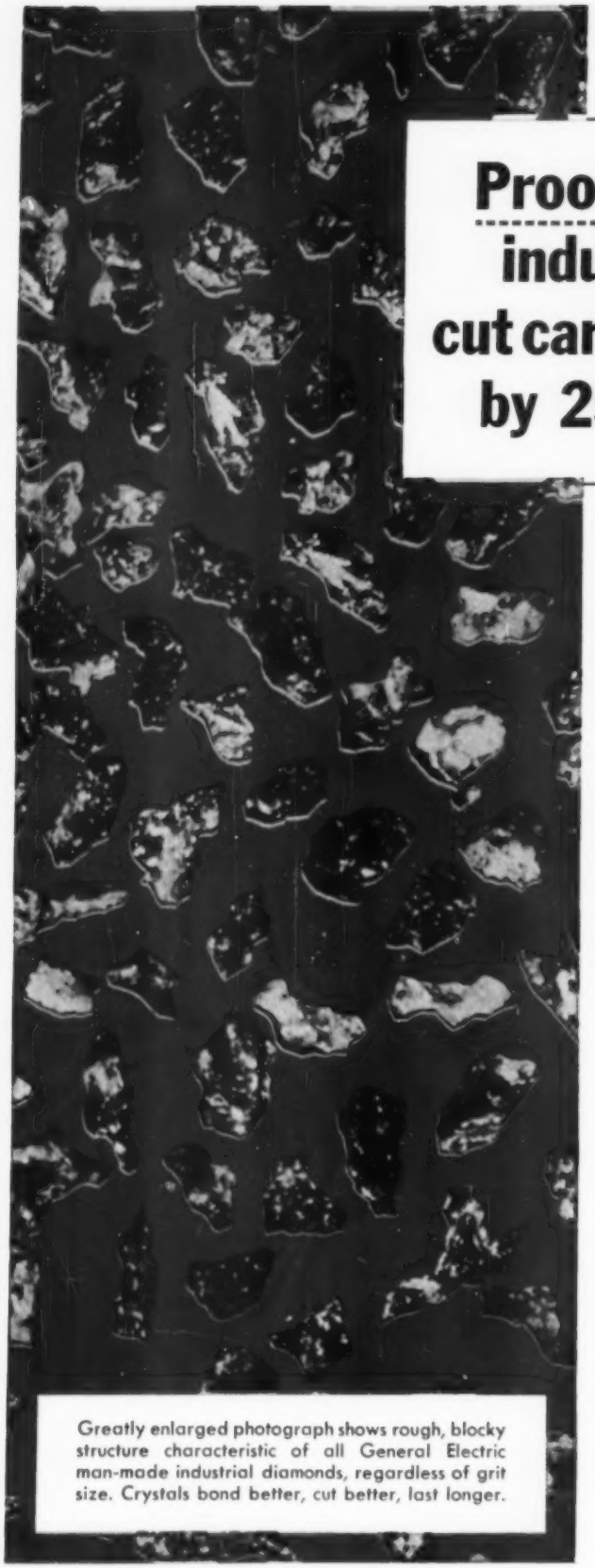
ALLISON ABRASIVE CUTTING WHEELS

Allison-Campbell Division • American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.

Metallurgical Memo from General Electric

Proof! G-E man-made industrial diamonds cut carbide grinding costs by 25%-35% average



Greatly enlarged photograph shows rough, blocky structure characteristic of all General Electric man-made industrial diamonds, regardless of grit size. Crystals bond better, cut better, last longer.

Diamond wheel users report on significant savings in switch from natural to man-made diamond wheels Here are some examples:

Automotive Manufacturer, cutter grinding: 5" x 1¾" x 1¼" flaring cup wheels, resinoid bond, 100 concentration, 100 grit—dry grinding. Man-made diamond wheel produced 1217 cutters and still had one-third of the wheel left. Natural diamond wheel produced only 696 cutters per wheel.

Power Tool Company, carbide burr grinding: 6" x ⅛" x 1¼" straight wheels, resinoid bond, 100 concentration, 180 grit—dry grinding. Wheel life with G-E man-made diamonds was 48 hours, while that of the natural diamond wheel was only 34 hours.

Saw Manufacturer, sharpening carbide knives and saws: 3¾" x 1½" x 1¼" flaring cup wheels, resinoid bond, 100 concentration, 120 grit—wet grinding with Cincinnati tool and cutter grinder. Man-made diamond wheel removed 70% more carbide with 57% less wheel wear.

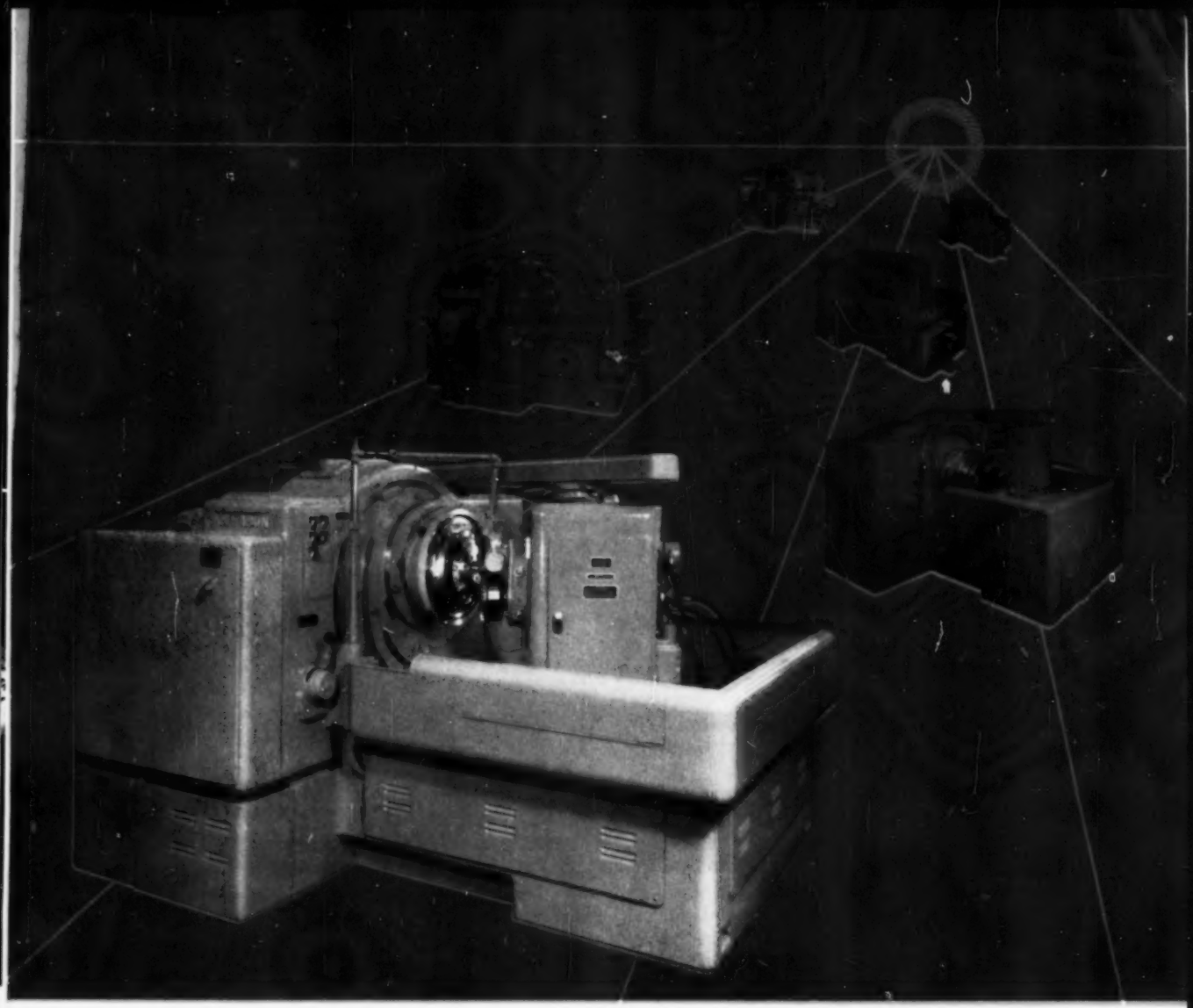
Laminated Die Manufacturer, internal grinding of carbide dies: 1½" x ¼" x ¼" straight wheels, resinoid bond, 100 concentration, 320 grit. Wheel with General Electric man-made diamonds cut faster with longer life than natural diamond wheel.

General Electric man-made industrial diamonds can make savings like those above possible in *your* plant. Specify them from your wheel manufacturers. *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Road, Detroit 32, Mich.*

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES
MAN-MADE DIAMONDS • VACUUM-MELTED ALLOYS
THERMISTORS • MAGNETIC MATERIALS • THYRITE®



Now . . . one machine does the work of five!

For small production runs—here's *one* gear-cutting machine with the flexibility of *five!*

The Gleason No. 118 Hypoid Generator roughs and finishes both gears and pinions—using four cutting methods that formerly required a battery of five machines. When production requirements increase, you simply add other machines, the 118 becoming a specialized member of your production team.

1. Single-Cycle® Method. Using this method, you can cut nongenerated gears four to five times faster than previously possible on machines of this type. Cradle and work head are locked in position. The last rotation of the Single-Cycle Cutter finishes both sides of a tooth space. You cut the mating pinions on the same machine, using the conventional single-roll generating method.

2. Cyclex® Method. For certain applications you can use the extremely fast Cyclex Method on the No. 108 Generator. You cut nongenerated gears in one completing operation from the solid blank.

3. Generated Gears and Pinions. You can produce both gears and pinions on this machine with the generating method. Here, a relative rolling motion takes place between gear or pinion and the rotating cutter. Once the gear is chucked in the work head, the machine operation is entirely automatic.

4. Unitool* Method. If you want to cut small quantities of spiral bevel, Zerol® bevel, or hypoid gears with a minimum of tooling, you can use the Unitool Method. You cut both gears and pinions with a single cutter. This method is particularly useful for experimental gears for prototype work.

*Trademark

The No. 118 Hypoid Generator handles gears up to 18″ diameter at a 10:1 ratio, to a *maximum* coarseness of 2 DP. For production of smaller gears, the No. 108 Generator cuts gears up to 8½″ diameter at a 10:1 ratio and to 4 DP. A third model, the No. 28 Hypoid Generator, cuts gears up to 33″ diameter at a 10:1 ratio, 1½ DP.

For complete information, send for bulletins on all three machines.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

CIRCLE 211 READER SERVICE CARD

Republic's CENTURY 100 SERIES of

High Strength, Stress Relieved, Cold Finished Steel Bars

What Is The CENTURY SERIES? A family of five grades of cold finished, specially processed, stress relieved bars having a minimum yield strength of 100,000 psi. Available from Republic in C-1144, C-1141, C-1151, C-1050, C-1045.

Why a CENTURY SERIES? To meet the needs of steel parts producers requiring high strength with varying degrees of machinability. The CENTURY SERIES assures dimensional stability with excellent machinability, provides high mechanical properties in a range of chemistries.

Republic's overall policy has always been to suggest the least expensive grade of steel that will adequately meet the mechanical requirements of the application and the degree of machinability desired.

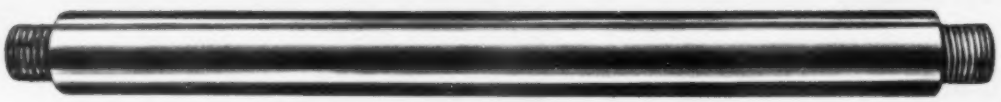
C-1144, for example, would be the proper choice for a part requiring high strength combined with maximum machinability. However, it may not be the best or most economical selection for parts on which machinability is not of prime importance.

Republic's CENTURY SERIES makes it possible to achieve considerable savings by selecting the grade best suited to a specific requirement. Where maximum machinability is not required a lower sulphur grade, such as C-1141 or C-1151, can be considered. If machinability is a minor factor, C-1050 or C-1045 may be considered. As sulphur decreases, toughness and resistance to shock increase. Therefore, it is frequently possible to obtain a better strength/toughness ratio at lower cost by using one of the lower sulphur steels as indicated on the chart.

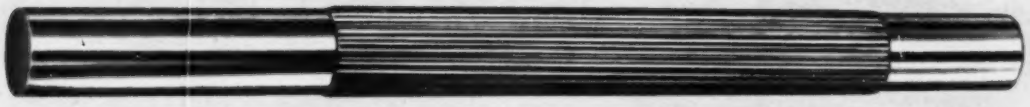
GRADE	ANALYSIS EXTRA	BEST COMBINATION OF STRENGTH & TOUGHNESS	MACHINABILITY
C-1144	$1.35		
C-1141	1.10		
C-1151	.70		
C-1050 & C-1045	.15		

Which Grade Is Best For Your Production? Republic offers the services of expert metallurgists—field, mill, and laboratory—and machining specialists to work directly with your personnel in selection, application, and processing of the right grade for your particular application.

CENTURY SERIES C-1144 Distributor Shaft

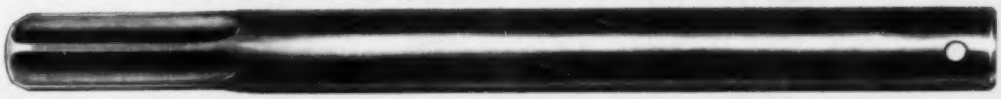


CENTURY SERIES C-1141 Hoist Support Shaft



CENTURY SERIES C-1151 Electric Motor Shaft

CENTURY SERIES C-1050 Axle



CENTURY SERIES C-1045 Shaft

Want More Facts? This FREE BOOK provides the basic facts you need to determine where Republic's CENTURY SERIES may help you save time and money in the production of steel parts. Mail the coupon for your copy.

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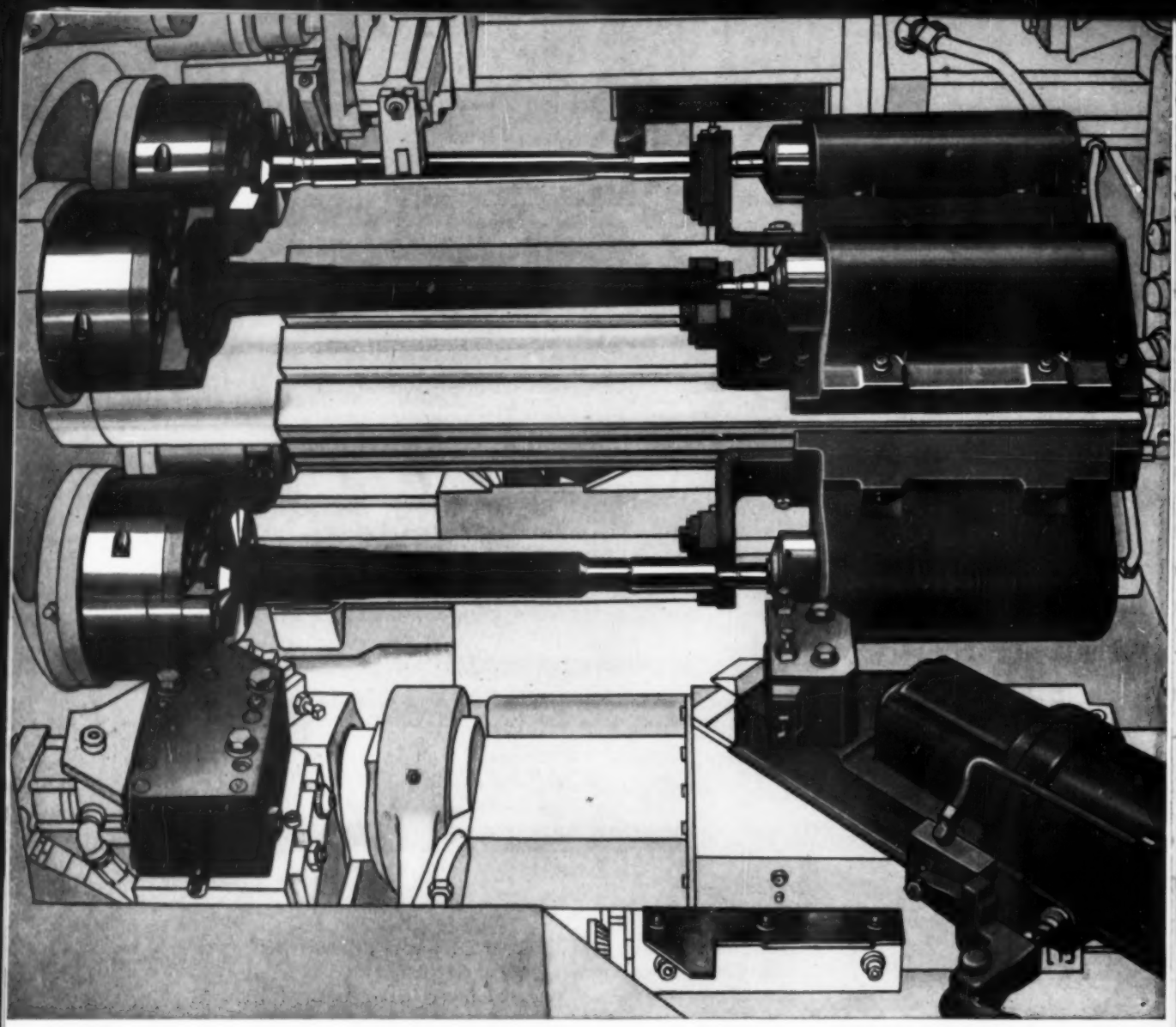


idea *for volume producers of shafts*

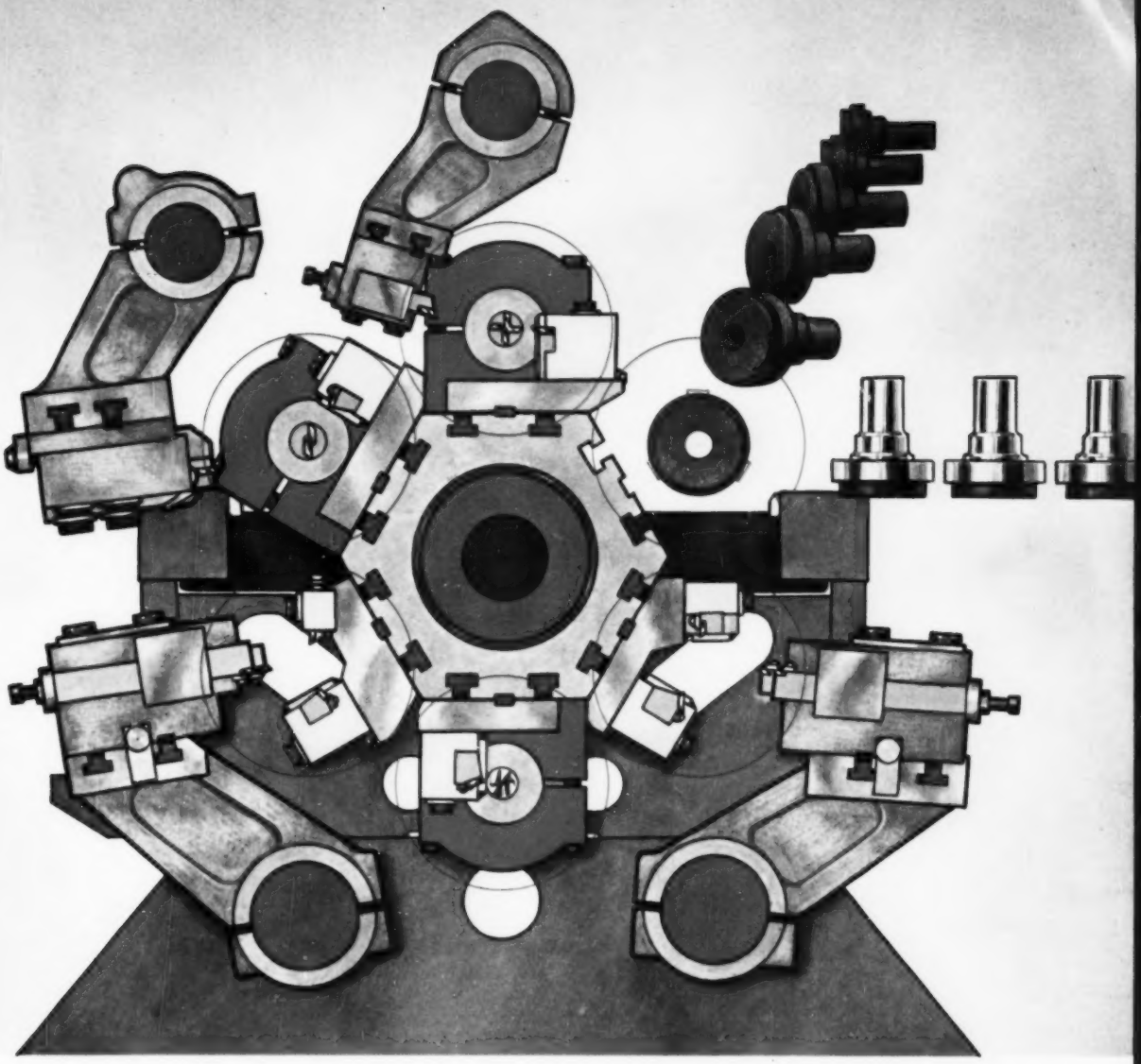
Economists are making startling predictions on this year's increase in productivity. They say it will be twice that of recent years – up as high as 10% in some manufacturing industries.

Whether or not these predictions come to pass, it's certain that it won't happen in plants using outdated equipment.

Shaft work is a problem to many firms. New Britain pioneered template-controlled contour turning and boring, solving the problem for many progressive companies. Now for the manufacturer with really high volume requirements we present Model 412/25–a four-spindle, template-controlled machine capable of producing a four-fold increase in productivity per man hour.

The basic principle pretty much speaks for itself. As in the case of the single-spindle contour lathe, inexpensive metal templates control the full cycle and re-cycle if required. Simple, single-point tools replace complex gang tooling. Set-up is simple and fast. When tools wear, merely replace them. Since all relationships are maintained by the template, tool replacement involves no problem.

When the volume of contour turning warrants it, this machine can be the best money maker on the production floor. Your New Britain representative can quickly tell you after looking at your prints and learning of your production requirements. Meanwhile, we would be glad to mail you descriptive literature containing the basic facts and specifications. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



two *approaches to the depreciation problem*

Until there is relief in the form of a more liberal tax depreciation policy, there's only one way to avoid the pinch of a shop full of over-age machines you can't afford to replace: *Buy machines that will stay new.*

If you are a user of New Britain chuckers you have seen their basic principles continue to stand as the most advanced design available, year in and year out.

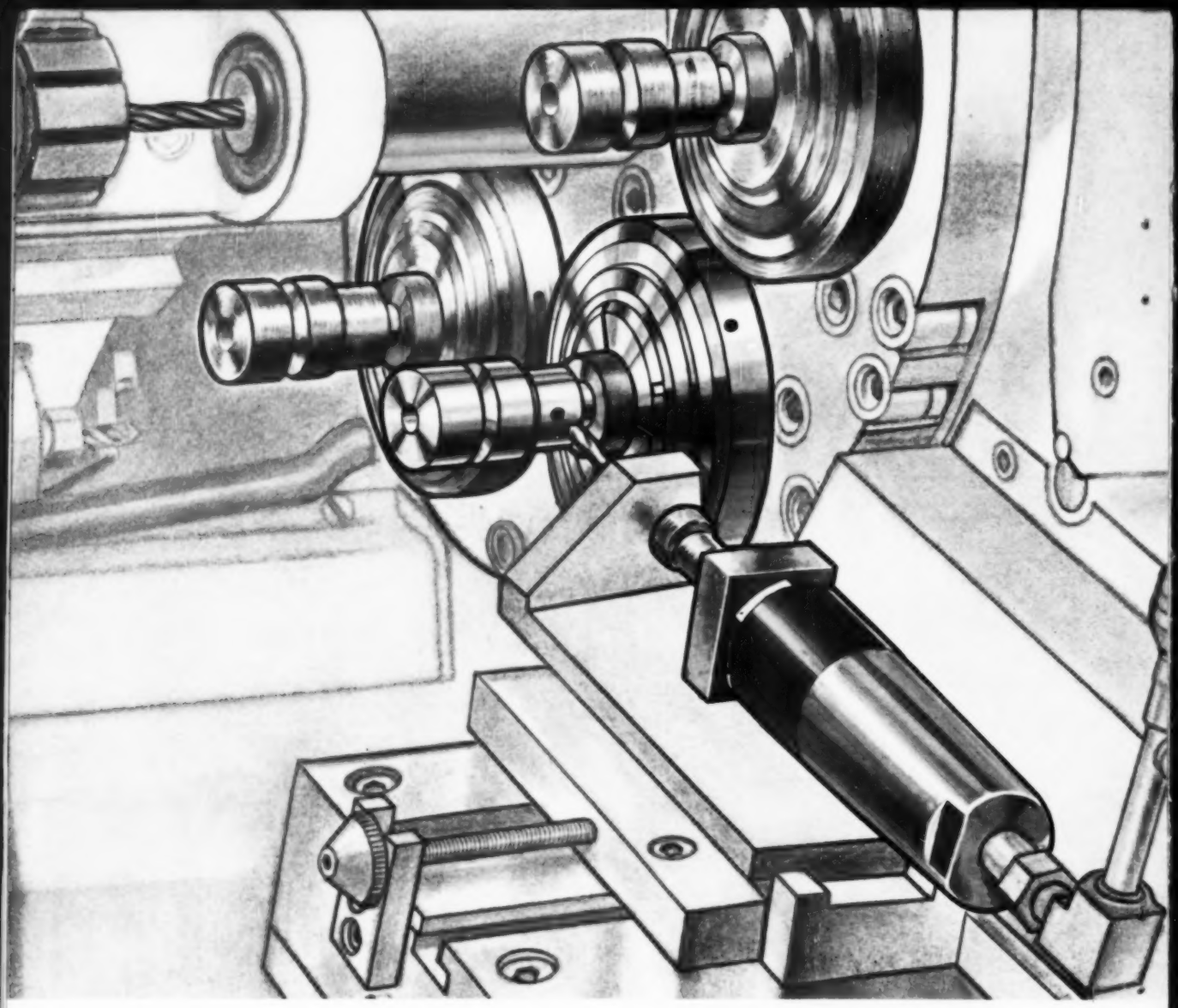
What value do you place on lifetime machine accuracy? The spindle carrier is the heart of a chucking machine. On a New Britain the carrier is lifted during index so it can't wear—then positively clamped to the frame during the cutting cycle for accurate cutting.

Interested in heavy facing and forming cuts? The long established New Britain swinging forming arm feature remains the best answer.

Want maximum clearance for fast and easy tooling, adjustment, and chip removal? Only New Britains are built with open end construction.

Today's New Britain chuckers provide the spindle speeds and power to take advantage of the most modern cutting tools. Optional tooling equipment includes drill speeders and attachments for reversing and non-reversing threading, recessing and accelerated reaming.

A new catalog describes the full New Britain line of 4-, 6- and 8-spindle, open-end, chucking machines. Fully illustrated in color, showing actual jobs, it may well suggest ideas for doing your work. Write for your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



1960 productivity **now**

If you have a voice in the purchase of machine tools you have probably begun to think in terms of what will be on exhibit at next year's Machine Tool Show.

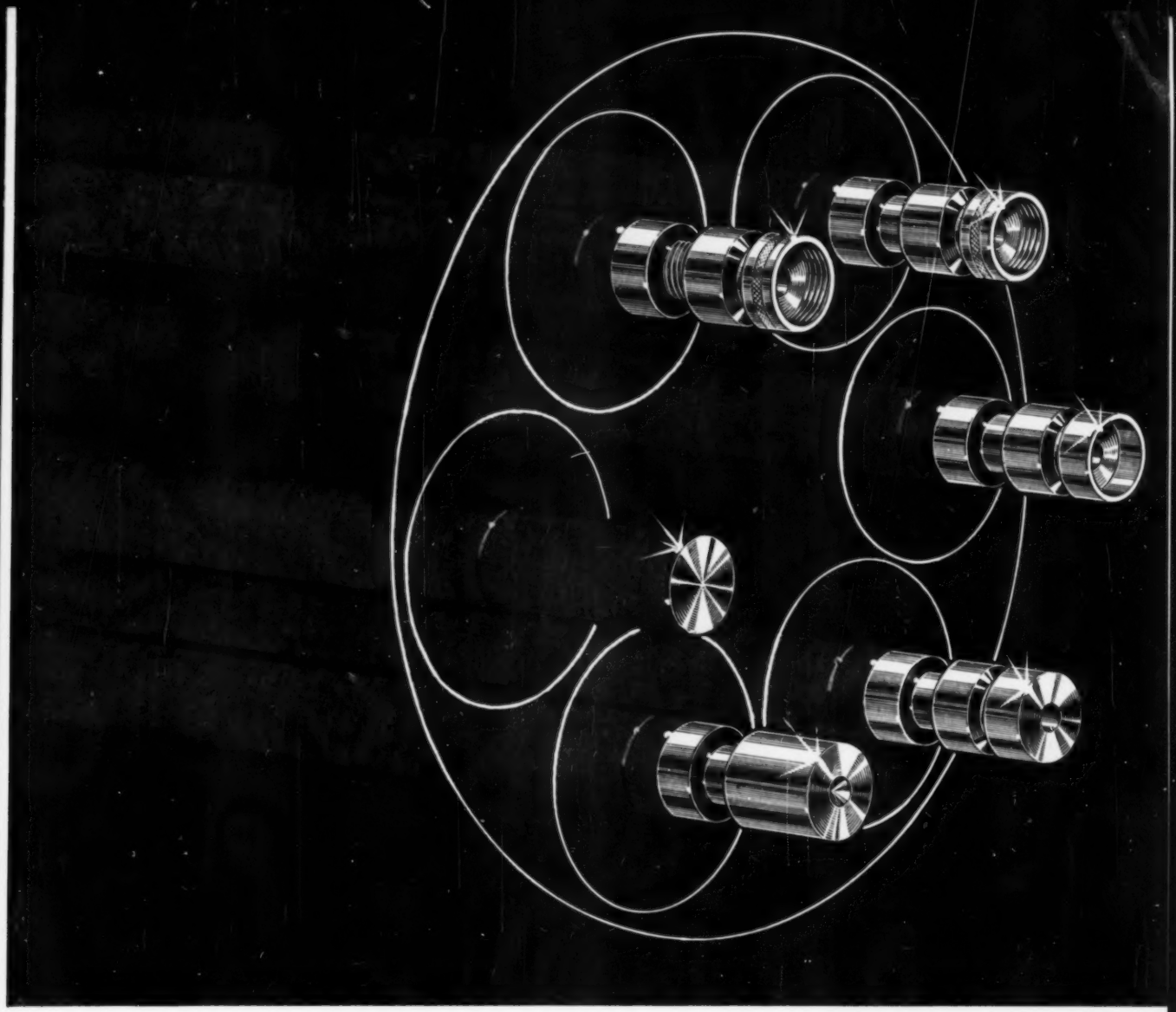
As far as multiple spindle bar work is concerned, you can see and buy and profit from the "show year" developments of New Britains a year ahead of time.

More operations, more pieces per hour, at closer tolerances has been the demand for years. Now New Britain has brought out a complete new line of bar machines that gives these words a brand new meaning.

Take the new Model 45 4-spindle series. The spindle capacity of 5" puts much larger pieces within automatic high-speed bar machine production range. Cross slides in all positions greatly increase the number and variety of cuts possible on four spindles. Spindle speeds up to 526 RPM provide for the use of the latest cutting tools. At the other extreme is a new line of 8-spindle machines. As you would expect with New Britain's radial independent cross slides, you can apply a tremendous number of tools and attachments to get very high production on really complex pieces. Or, with a double indexing set-up, you can turn out pieces, even pretty complex ones, at an all-time high rate per hour.

Six-spindle machines are everybody's work horses and New Britain offers the Model 52 in the 1¼" range, and the Model 62 with 2¼" capacity. These machines allow you to use a greater number and variety of tools on them without sacrificing accessibility. They can be tooled quickly and you can get at the tools for changes or adjustments with ease.

We can only suggest here some of the "show year improvements" in a greatly expanded line of New Britain bar machines. Your New Britain representative will be glad to arrange for a demonstration, and secure performance data based on your prints. If you would like to look over a catalog first, we'll be glad to send you complete descriptive literature. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.



3½"—More **capacity** *than ever in a New Britain*

Model 82 • Six Spindles • 3½" Capacity • All New

Here is a *brand new* New Britain . . . the most modern large capacity bar machine available. The Model 82 brings to the 3½" size range all the versatility and exclusive New Britain features previously available only on smaller models. Designed from the ground up for large capacity work, the Model 82 is the only 6-spindle machine on the market that offers a really up-to-date replacement for the older, slower methods currently used for this size range.

Each of the six spindles on the Model 82 has an independent, cam-operated cross slide. These cross slides combined with the end-working tool slide allow practically unlimited tooling combinations.

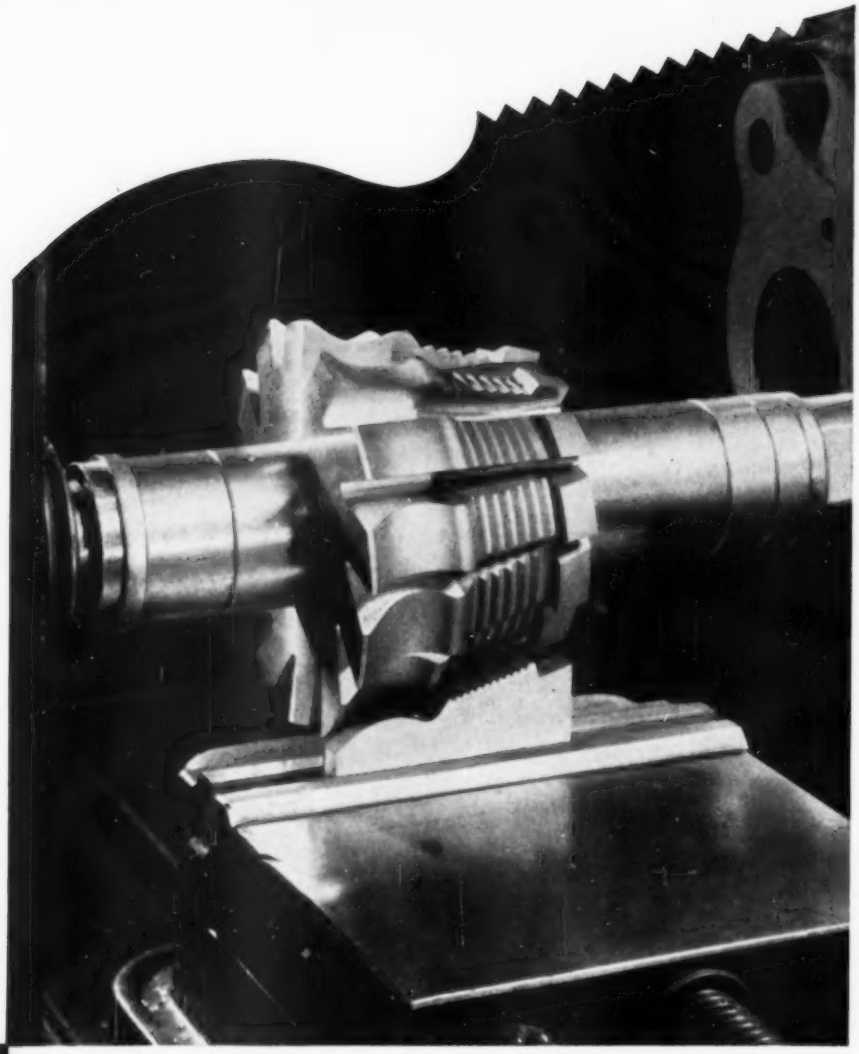
The Model 82, like all New Britain Bar Machines, has a special lifting and locating mechanism which prevents wear on the spindle carrier. Rigid locking of the carrier to the massive frame during the cutting cycle eliminates vibration.

The power, massiveness, speed range, accuracy, ease of changeover, coolant capacity and every other feature designed into the Model 82 makes this the right machine for high-precision, high-production, large-capacity bar work.

Why not investigate the possibilities the Model 82 offers in your plant? When you get right down to it, it's the first chance you've had in a long time to update production in an area that needs it badly. Complete catalog material is available on the whole range of New Britain Six Spindle Bar Machines. For your copy, write to The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Conn.

◄ CIRCLE 216 READER SERVICE CARD

CIRCLE 217 READER SERVICE CARD



Cutters with built-in Efficiency and Accuracy

This is an example of how efficiency and accuracy can be designed right into the cutting tool. The manufacturing and engineering capabilities of Barber-Colman Company can be added to your own in finding better solutions to milling problems.

The form shown at the left of the part is milled at the same time the multiple serrations are cut. Milling sharp points on the serrations is made possible by the alternate tooth design (see photo, above). The cutter is shown milling a sample which is later projected against an enlarged layout of the part to assure that the cutter will produce within specified tolerances. But, some of the most important quality features of this cutter are not visible to the naked eye.

Unground form . . .

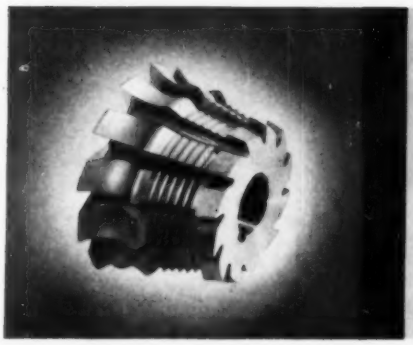
Ability to combine complex tool geometry and accuracy in this cutter without form grinding reduces original cost. In addition to greater accuracy, you get longer tool life from a cutter that is metallurgically as well as geometrically well formed. Barber-Colman's individual processing in the most modern metallurgical lab and heat-treating department assures highest quality which can be tested by the number of high-quality parts manufactured for every dollar of cost.

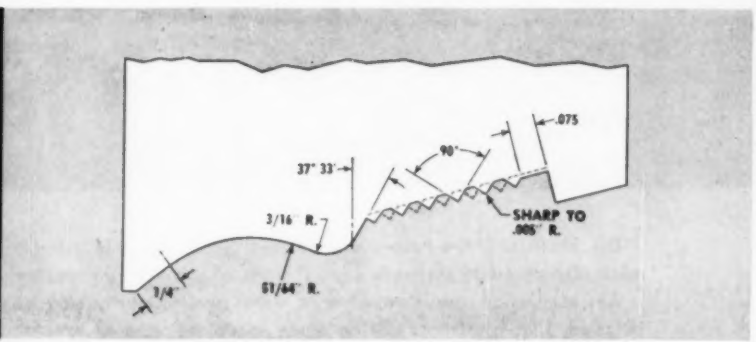
Sharpening economies . . .

Additional savings result from Barber-Colman's exclusive design and manufacturing techniques. For example,

Mill Odd Shapes in One Operation

...with Barber-Colman Form-Relieved Cutters





the smooth finish on the tops and sides of the teeth eliminates rough edges — a common cause of breakdown on the flanks. Faces are index-sharpened, permitting the important economy of *automatic resharpening*. Your sharpening guide or an automatic sharpener will maintain original accuracy throughout the life of the cutter.

These economies reduce the most important elements of tool cost: the cost of scrap and rework, cost of sharpening, cost of downtime for tool changes, and cost of tool depreciation.

Five types of engineering...

You get more than a cutting tool when you buy "Barber-Colman." You get five types of specialized engineering that reduce your costs and upgrade your quality:

1. *Application engineering* — on-the-spot evaluation of milling problems by experienced tool designers.
2. *Design engineering* — highly specialized tool engineering, backed by electronic computer facilities for fast, accurate calculation of complex forms.
3. *Metallurgical engineering* — specially selected steels and heat treatment for your particular material and tool geometry.
4. *Manufacturing* — the most complete and advanced processes under one roof for producing exactly the right finish, highest accuracy, and *any* cutter style.
5. *Quality control* — optical master inspection, seven different control stations, and numerous separate inspections for individual cutters.

Whether you want to combine operations, change processes, or just get more out of your tooling dollar, you can have a Barber-Colman field engineer at your desk for consultation by just calling Rockford — TR 7-5741.

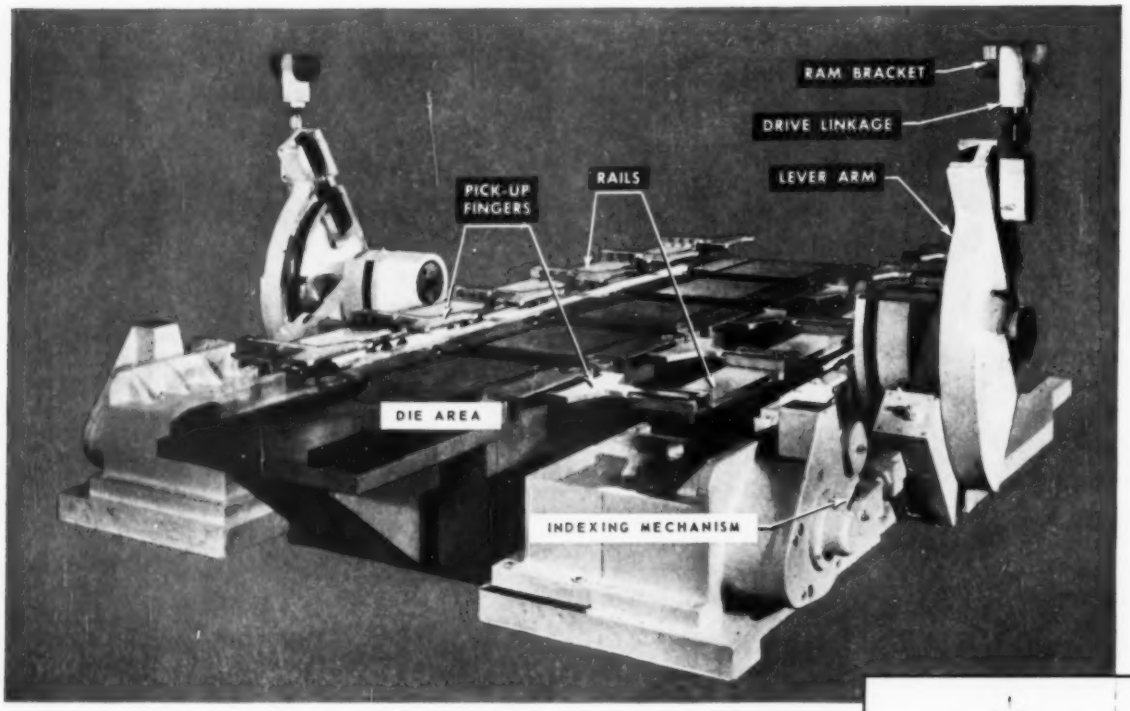
Barber-Colman Company

BARBER COLMAN ®

71 Loomis Street, Rockford, Illinois

SHEFFIELD ~~PRESS PACERS~~

SUBSTANTIALLY INCREASE PRESS OUTPUT



The Sheffield Press-Pacers are all readily demountable transfer mechanisms used to automate one or a line of straight-side presses.

Any number of transfer operations within press capacity may be included. Thus, one press can be made to do the work of several.

Coil stock, blanks or pre-drawn work parts may be handled with equal facility.

OPERATION

The Press-Pacer receives the work and advances it from die to die and from press to press—all automatically.

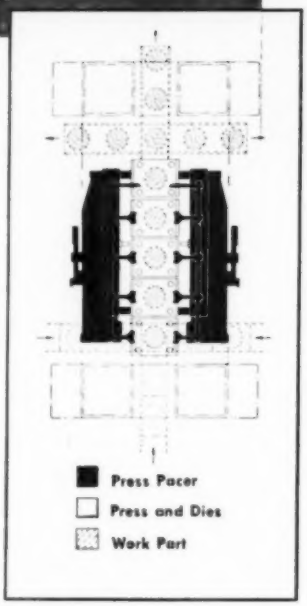
Work parts may be traversed in any desired direction—front to back, right to left or the reverse.

PRODUCT CHANGE DOES NOT OBSOLETE THE PRESS-PACER

Feed fingers are interchangeable and easily replaced when the product is changed. Traverse distance between dies and between presses is fully adjustable to changed requirements.

Installation of the Press-Pacer can be done in just a few hours. It may be removed from a press in a matter of minutes.

8005



Write for Catalog No. PP3M-57 to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.

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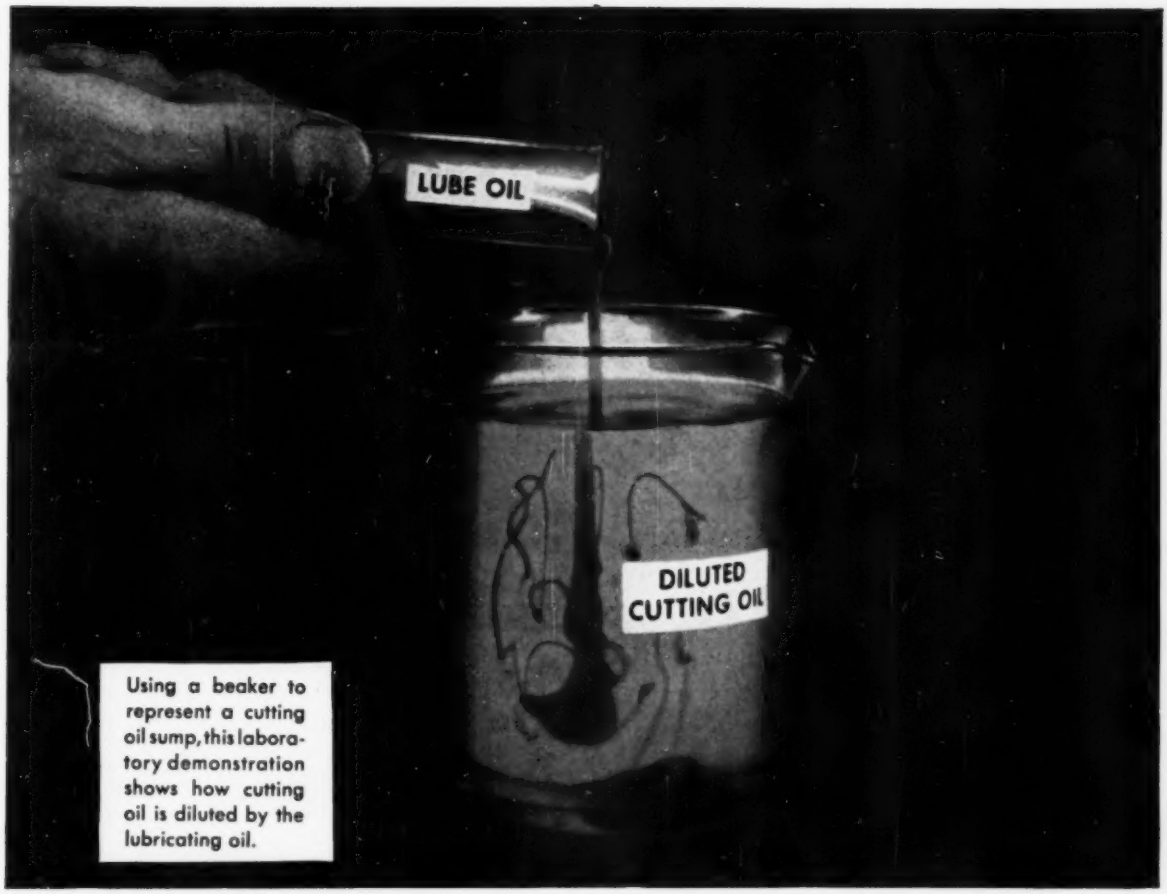


Using a beaker to represent a cutting oil sump, this laboratory demonstration shows how cutting oil is diluted by the lubricating oil.

Diluted cutting oil can cut output 33%

No matter how careful your lubricating techniques, you still can't stop lube oil from leaking into the cutting oil sump on 70% of automatic screw machines. As cutting oil is diluted, it loses strength—ingredients that make it efficient become less and less effective. The natural consequence is shortened tool life, more downtime and a higher percentage of rejects.

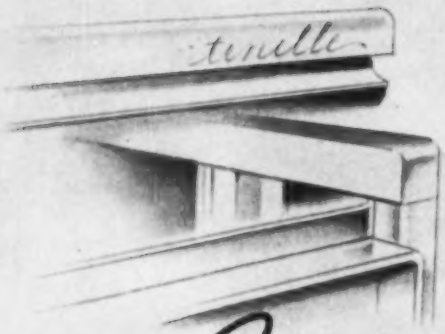
Texaco Cleartex can end this problem forever. All you have to do is use Cleartex for both cutting *and* lubrication . . . and watch your production rise. The exceptional chemical stability and load-carrying ability of the Cleartex series make them equally suitable for use as cutting oils, lubricants and hydraulic fluids. (70% of all automatic screw machines can benefit from the "Cleartex Cure!")

TAKE THE CLEARTEX CURE SOON!

Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it . . . Or contact your local Texaco Lubrication Engineer soon for an authoritative survey of your automatics. Just call the nearest of more than 2,300 Texaco Distributing Plants, or write to Texaco Inc., 135 East 42nd Street, New York 17, New York. Dept. AM-12.

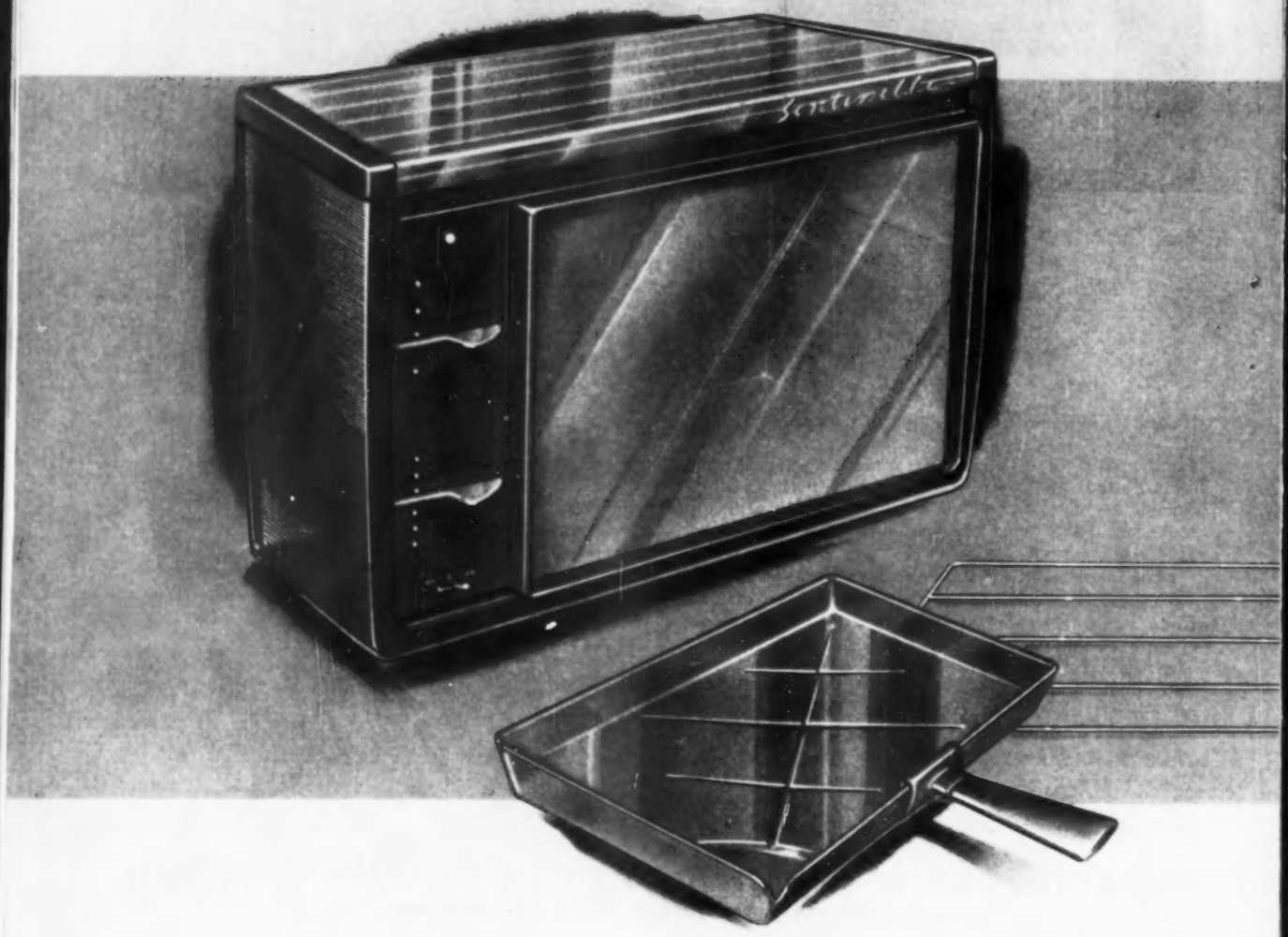
LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)



One of America's best known and most successful designers, Russel Wright, is practically a household word to Mrs. America. He, more than any other one man, has brought practical design to the average American housewife. Mr. Wright believes "good design" should be universal and his general aim is to create the widest variety of products for the widest possible market at the lowest possible cost so that "good design" can reach everyone.

Russel Wright designs with.



...SHARONART*

The portable broiler is high on the list of appliances most wanted by the modern American housewife. Until recently, little attention was paid to its design. The unwieldy bulk and lackluster styling of most models contrasted with the functional beauty of today's colorful kitchens and kitchen tools.

Russel Wright, world famed designer, has applied his talents to this appliance and has created a broiler with the attractive tailored look designed to harmonize with modern day kitchens.

In place of the outmoded polished chromium cover, Mr. Wright has utilized Sharon Steel's exciting new Sharonart* stainless in combination with a main shell of colored baked enamel over textured Sharonart*. Russel Wright has replaced impractical broiler operation with simple, functional, press-down levers that automatically set the thermostat and timer, and has included a stainless steel well-and-tree tray designed to be carried to the dining table and generous bakelite handles for safe carrying of the unit.

Whether you make broilers—or any other appliance—it's certain Sharonart* will give your product the same fresh look Russel Wright has achieved in this broiler design. *The Sharon Steel Corporation, Sharon, Pa.*

*T. M.

SHARONSTEEL **SHARON** *Quality* **STEEL**

ACCURACY

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The men you'll do business with are experienced, factory-trained cutting tool specialists . . . not just "order-takers." Their expert advice will insure the right tools to do your jobs faster and better. You'll be sure to get the biggest return on every dollar spent, because P&W Cutting Tools are QUALITY from start to finish — last longer and produce more, accurately finished pieces.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

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CIRCLE 224 READER SERVICE CARD

ASSURED...

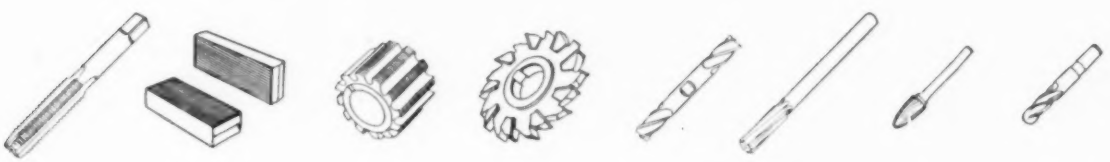
...WITH **NEW** PRATT & WHITNEY END MILLS, NOW FEATURING THE **PERFECT** "FLOW CURVE" FLUTE!

End mills featuring a flute form that engineers have always considered ideal – but which has never before been attained in actual production – are now carried in stock by Pratt & Whitney Branch Offices.

These completely new Type "G" End Mills are ground from the solid to produce a generated flute shape in one continuous, flowing curve. This "flow curve" section and the polished flute surfaces eliminate chip traps. Another important new feature . . . the use of eccentric radial relief instead of the customary flat relief . . . provides a more rigid cutting edge and eliminates heel drag. These unique features – plus the smoother, sharper cutting edges, superior heat treatment and other quality features found in *all* P&W Cutting Tools – mean faster, smoother cutting, better work quality and longer life than you ever believed possible.

REMEMBER, NO MACHINE TOOL IS ANY BETTER THAN THE CUTTING TOOL IT DRIVES . . .

so phone your nearby P&W Branch Office today, and ask a P&W Specialist to help make your selection from the finest cutting tools available anywhere. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Connecticut.



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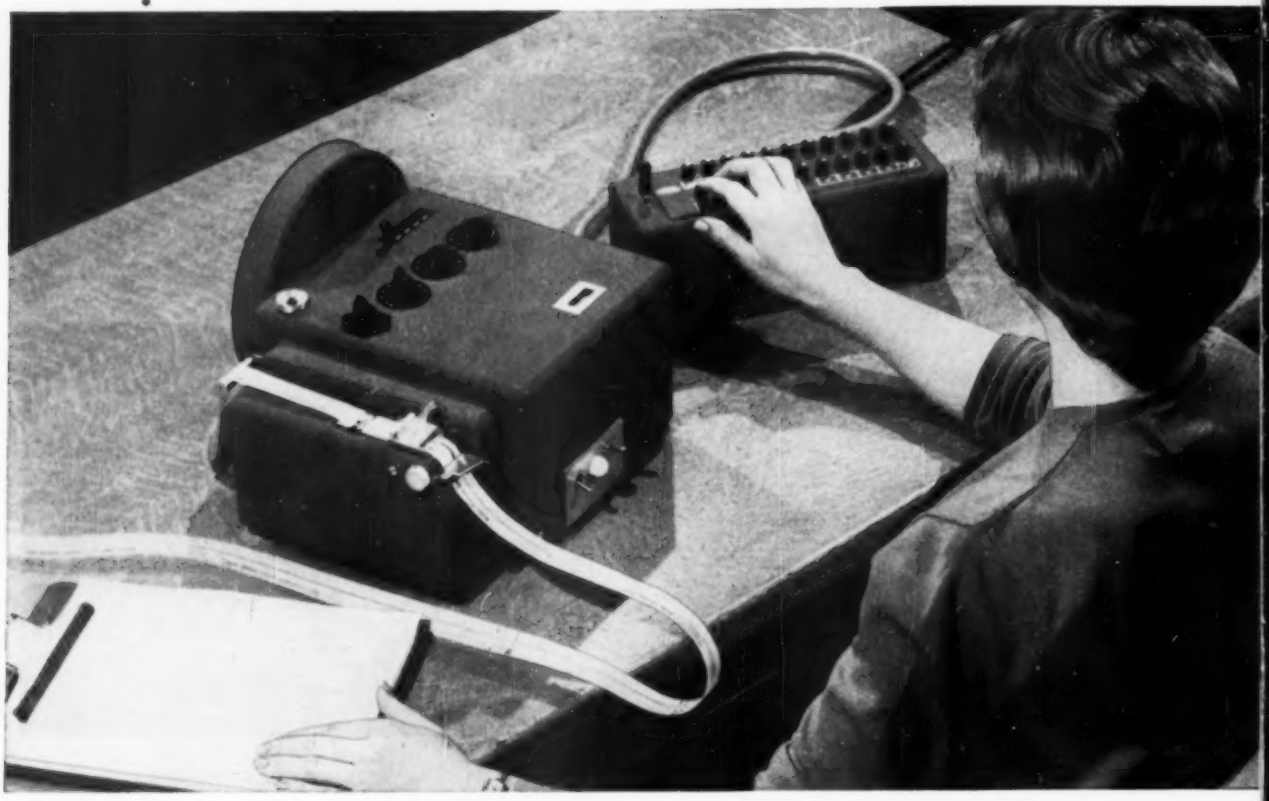
Here's the PRACTICAL* approach

POTTER & JOHNSTON



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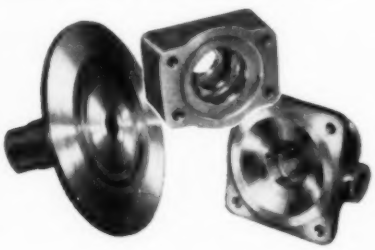
*LOW COST . . . priced far below other tape control systems.

*SAVES TIME . . . as much as 25%.

PREPARING THE INITIAL TAPE TAKES LESS THAN 30 MINUTES . . . for the average job, and preparation is readily handled by any clerical or other non-technical employee. Since the tape is easily stored for re-use, additional time is saved on every repeat run. Using a simple code table, a "program chart" is first prepared from the regular operation sheet. No mathematical computations or conversions are involved. Following the coded data on the program chart, the tape is then punched, using the compact tape preparation unit. This is equipped with easily set dials for moving the tape to the correct address points . . . and clearly marked buttons that are pressed to punch all necessary machine commands into the tape.

ALL PROGRAMMING SETUP TIME IS ELIMINATED . . . by simply placing the tape in the machine's tape reader —which takes only a couple of minutes. Unusually compact, the controls are installed as part of the machine and occupy no additional floor space.

PARTS ARE COMPLETED IN MINIMUM TIME . . . under tape control, because the entire machining cycle is programmed by the Engineering Department instead of the setup man. As a result, machine spends *more* time cutting metal, *less* time "cutting air."

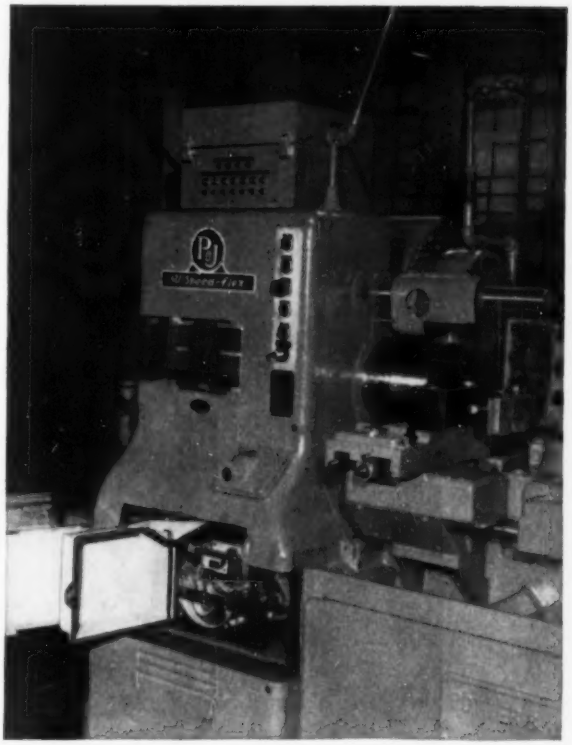


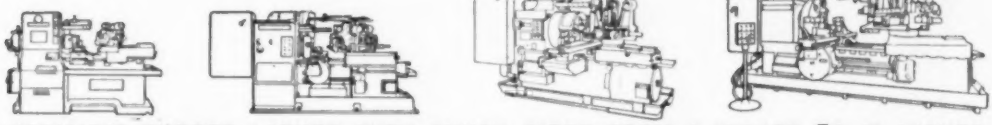
to Automatic Machine Programming

TAPE CONTROL

Potter & Johnston Tape Control is a unique new type of control system that makes the advantages of automatic programming available on a practical, economically realistic basis. The very low initial cost of $3,500.00 is possible, because of its simplicity. It is not electronic, and therefore requires no tubes or transistors. Unlike other systems, P&J Tape Control can be easily added to current models of Potter & Johnston Automatics already in the field, in addition to being available on new machines.

Operating under the P&J Tape Control System, all motions of the machine's spindle, turret and cross slides—including all speed and feed changes—are controlled by a quickly prepared plastic tape. As a result of the increased efficiency made possible by this system, a manufacturer using a P&J Tape Controlled Automatic in regular production has already reported savings of 25% in machining and setup time. In addition, the cost-cutting benefits of automatic machining are now made available for many production runs involving 25 pieces or less.



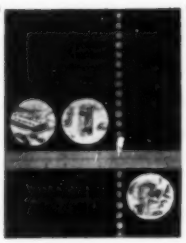


. . . . AUTOMATIC TURRET LATHES WITH CHUCK SIZES FROM 6 INCHES TO 42 INCHES . . . .

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898



YOU'LL FIND ALL THE TIME-SAVING FACTS . . .

on P&J Tape Control in this new circular. Use the coupon here to send for your free copy. See for yourself how this unique system can provide the practical, simple answer to your profit-building, cost-cutting requirements.
Potter & Johnston Company,
11 Charter Oak Boulevard
West Hartford, Connecticut
(formerly Pawtucket, R. I.)

POTTER & JOHNSTON Company,

Please send my free copy of Bulletin No. 176 fully describing P&J Tape Control for Automatic Turret Lathes.

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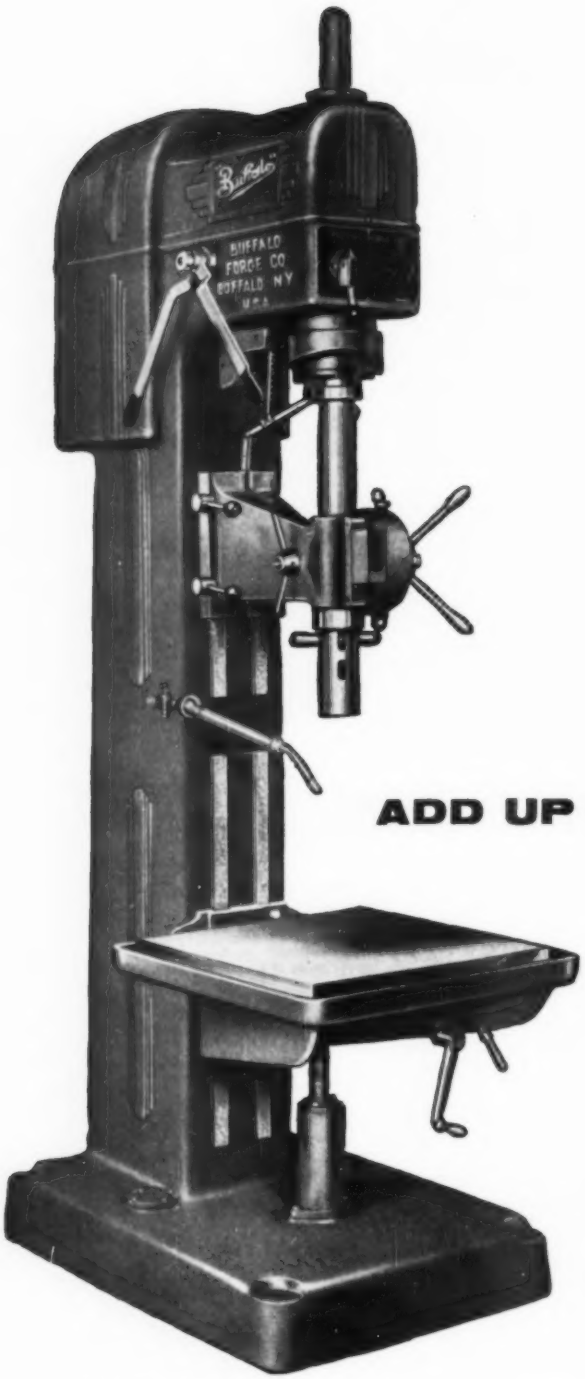
CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____



ADD UP THESE FEATURES AND

NEW "BUFFALO" R-P-Msters With Greater Capacities and Torque Controlled Feed

The first and best variable speed drilling machine brings you important new improvements. One is higher capacities. "Buffalo" R-P-Msters are now available for up to 2" in mild steel. Another is exclusive "Buffalo" Torque Controlled Power Feed. With the new R-P-Msters you can now safely use maximum speed and feed for the size hole being drilled. No need for worry about damage to drill or machine gearing. This torque control on the feed shaft positively eliminates danger of overloading the machine.

Moderate prices give you more drill value than ever in the new R-P-Msters. But you must try the new

R-P-Mster for yourself. Only then will you realize how smooth and easy to operate a drill can be. Rugged "Buffalo" construction insures long life with minimum maintenance.

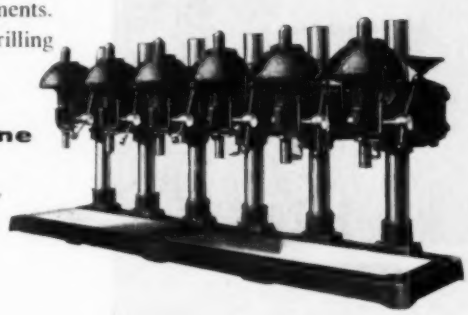
For maximum accuracy in high-speed production drilling and tapping, investigate the new "Buffalo" R-P-Msters. Use coupon below.

"BUFFALO" No. 16 Drilling Machine

Check these top-value features of the "Buffalo" No. 16:

- 6-Spline Alloy Steel Spindle
- 5-Speed V-Belt Drive
- All-Geared Power Feed
- Hardened Tool Steel Clutch Members
- Hand-Scraped Table Ways
- Easy-to-Operate Table Raising Screw

Capacity is ⅞" in mild steel. Husky construction assures long, dependable life. Available in bench, floor and pedestal types. Multiple units up to 6 spindles. Options include power feed, motor reverse tapping and other attachments. See how the "Buffalo" No. 16 Drill can cut your drilling costs. Send coupon today.



"BUFFALO" NO. 18 Drilling Machine

These sturdy drills are ideally suited to multiple operations in heavy production runs. Capacity is 1" in cast iron. There are 19 models of the "Buffalo" No. 18 Drill.

YOU'LL PROBABLY SELECT A "BUFFALO"

One is sure to fit your job to a "T". Choose from bench, floor and pedestal models or multiple units up to six spindles. A full range of accessories is available.

The "Buffalo" No. 18 is easy to operate, easily adjusted. Quick setup changeovers mean more production time. Accuracy, versatility and durability are unsurpassed. Six-spline alloy steel spindles turn in 2 sets of precision ball bearings. This assures continued smoothness of operation without deflections.

See how the "Buffalo" No. 18 Drill can step up your production. Send coupon at right, or contact your "Buffalo" machine tool dealer.

BUFFALO FORGE COMPANY
Buffalo, New York

Please send me complete facts on the "Buffalo" Drilling Machines checked:
☐ R-P-Mster ☐ No. 18 ☐ No. 16

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SOME OF OUR JIGMIL USERS

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a man who came

"I first heard of the JIGMIL Technique for boring accurate holes in precise locations at an engineering lecture-meeting in Philadelphia. What I heard made me curious because the story seemed exaggerated."

Kempsmith Machine Company
Kidder Press Co., Inc.
McNally-Pittsburg Mfg. Corp.
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Parrish Machine Co., Inc.
Rockford Machine Tool Co.
S & S Corrugated Paper Machy. Co.
Stacy Machine Works, Inc.
Sunnen Products Company
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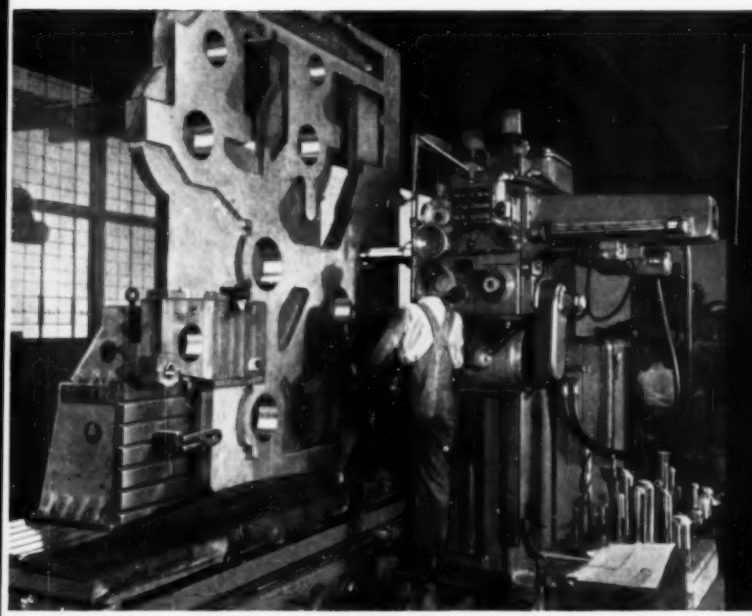
"I accepted an invitation to go to Fair Street and there saw the JIGMIL Technique in operation doing jigless boring to degrees of economy and precision that verified what I had heard in the lecture. The gains that were apparent from the analysis made for us by the DeVlieg engineers caused us to purchase a number of JIGMILS. These machines have been in use for several years. We have experienced many advantages. The principal ones are improved quality and a considerable reduction in machining, inspection and assembly times. The quality of the work resulting from the outstanding JIGMIL accuracy has had a far-reaching improving effect on the general quality and performance of our product."

A. O. HOLMBERG

WILL YOU BE THE NEXT TO VISIT FAIR STREET **DE VLIEG MACHINE COMPANY,**

CIRCLE 230 READER SERVICE CARD

to Fair Street



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE—

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL ACCURACY

Goss uses the JIGMIL Technique for boring components of their famous high-speed newspaper, magazine and color printing presses. Illustrated above is one of the side frames for an 80 ft. multi-color press recently built by Goss. This part was bored on a Model 4B-120 SPIRAMATIC JIGMIL. JIGMILS were used for boring approximately 2260 holes in the side frames and gear boxes for this press. In the assembled press, the accuracy of hole size and spacing made it possible to hold the register of 5 colors within .001".

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SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

CIRCLE 231 READER SERVICE CARD

The one hydraulic press brake built for operators... not maintenance engineers

To all outward appearances many hydraulic press brakes may *seem* alike but that is where the similarity ends. Inside the PACIFIC is the most sensibly simple, patented level control system ever devised . . . only 6 microswitches and 2 relays provide the precise PACIFIC accuracy that no other hydraulic press brake can even remotely approach. Free of lineal variable differential transmitters, electronic amplifiers, photo-electric relays, amplidyne generators, complex hydraulic servo-valves, variable volume pumps and other complicated gadgets, PACIFIC hydraulic press brake can be kept in continuous operation by the ordinary plant maintenance man without the costly services of a professional hydraulic or electronic engineer from some distant factory. PACIFIC can be maintained for pennies per operating hour . . . only a fraction of the cost of the complicated machines.

Costs only 4.4¢ per hr. to maintain . . .

EARNS $7.50 NET PER HOUR

Pacific Hydraulic Press Brake at Atlas Universal Service, Inc., San Francisco, has operated continuously 16 hours a day for 9 years and 27 days with average maintenance downtime of only 5.2 hours per year and a total maintenance expense of 4.4¢ per operating hour.

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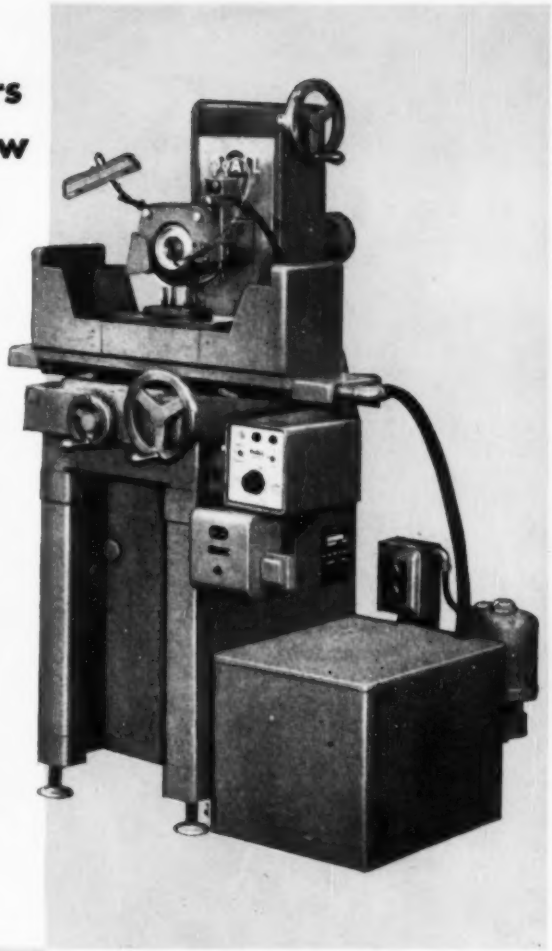
No other manual grinder offers so many advantages as the new DoALL Model DH-612



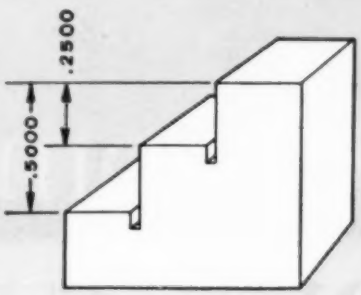
You've never seen a manual surface grinder with such accuracy, convenience and all-around flexibility as the DH-612. Compare it with all the rest—and see.

Accuracy—The DH-612 grinds to closer tolerances than others in its class. It is easy to grind accurately to handwheel calibrations—vertical feed to .0001" and cross feed to .0002". The 1 h.p. motorized or belt-driven, permanently lubricated, anti-friction bearing spindle provides steady, precise grinding action. There is no table climb because the saddle ways support the entire work area to the extreme ends of the table travel.

Convenience—Machine height can be adjusted for individual operators. The table drive handwheel can be easily moved for left- or right-hand operation and the wheel handle positioned to suit the operator. A one-shot lubricator oils all moving parts.

Flexibility—A complete line of attachments includes a downfeed handwheel extension to bring all controls within easy reach of a seated operator, also "Cool Grinding" coolant system, and hydraulic table operation. The grinders leave our factory prepared to accept these attachments at any time in the customer's plant.

ACCURACY PROVED



"Hardened tool steel step block"

The DH-612 grinds this step block directly from handwheel calibrations to "tenth" accuracy. This eliminates the grind-and-measure techniques commonly used. This impressive demonstration is one of many performance features that make the versatile DH-612 grinder outstanding.

The DoALL DH-612 Surface Grinder

Table travel: 7" x 13"
Work height: 0" to 12½"
Vertical-feed handwheel graduated in tenths
Saddle lock for form and plunge grinding
Full range of optional equipment:
- Zeroing slip rings for cross and downfeed
- Through-the-wheel "Cool Grinding" and flood coolant system
- Hydraulic table drive
- Magnetic chucks, permanent and electric types with DoALL SELECTRON® Rectifiers
- High-speed spindle attachment

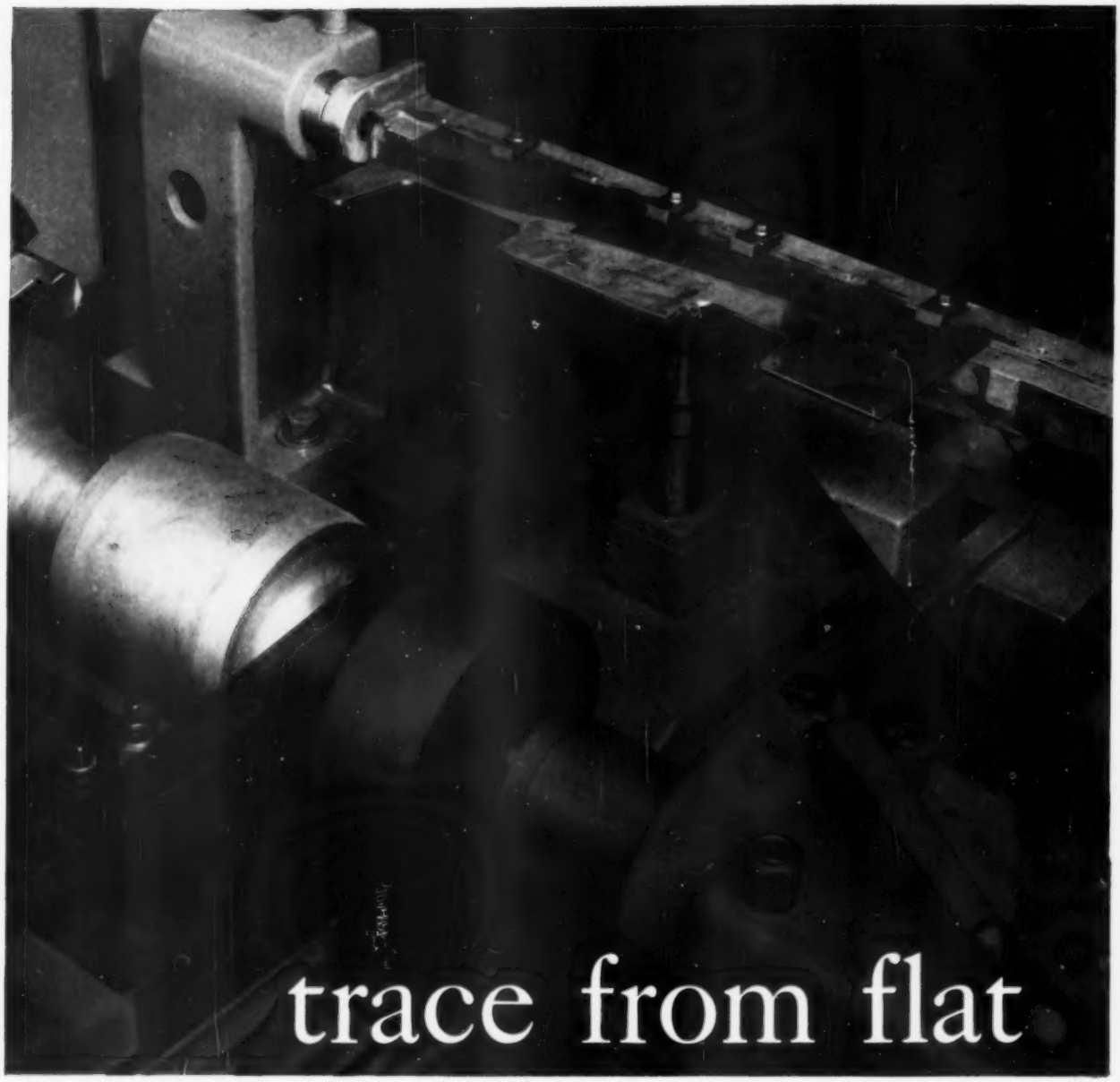
SEE IT – TRY IT at your local DoALL STORE

See the new DH-612 grinder. Try its many advanced features. Call your local DoALL Sales-Service Store or write:

GR-28

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois



trace from flat with LeBlond's new

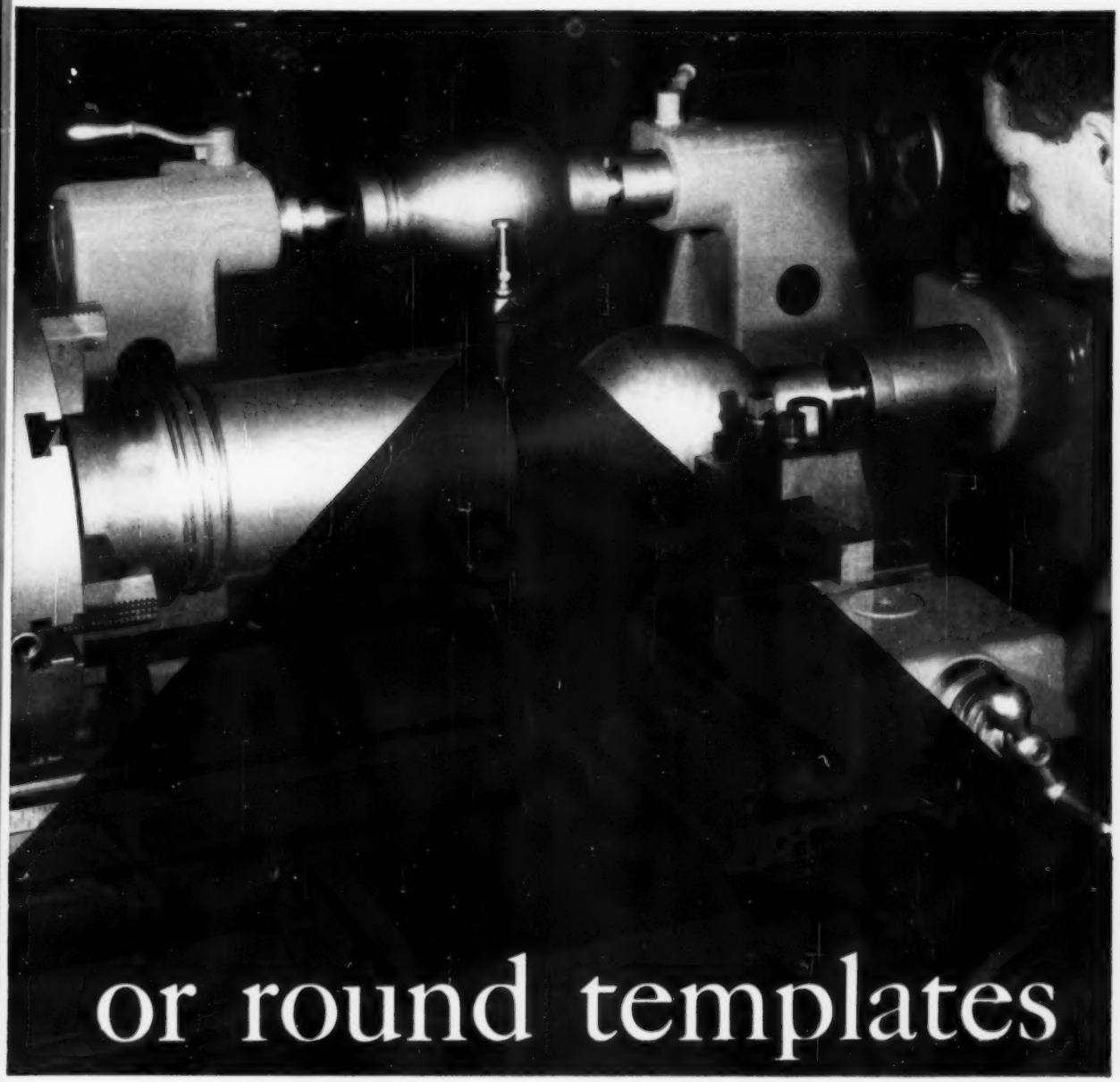
available on 13", 16", 20", 25" and 32" Heavy Duty Lathes
16", 20", 25", 32" and 40" Standard Duty Lathes

EXCLUSIVE ADVANTAGES

No loss of swing capacity (raises unnecessary). Tracer system allows full horsepower at tool.

All hydraulic controls conveniently located at apron—change from trace to conventional simply by adjusting two nuts at apron.

No overarms or other obstructions to loading templates—



or round templates

90° Tracer

all components, including hydraulic pump and tank, integral with cross slide.

Positive mechanical linkage between stylus and tool slide —no strain on cross feed screw and nut.

Tolerance—.001″ on diameter; .001″ on shoulder length.

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. . . cut with confidence

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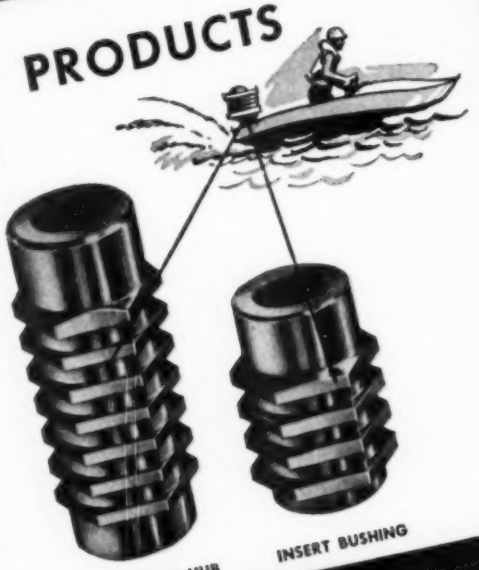
two typical cases where MUELLER BRASS *determined the best and most*

CASE HISTORY 1750

SCREW MACHINE PRODUCTS for outboard motors

Mueller Brass Co. Methods Analysis Engineers, after careful consideration of every aspect of the job requirements, found that the best method of producing these 2 outboard motor parts at the lowest cost was as screw machine products made from hollow hex rod. The insert drive hub and insert bushing are used in the lower units of one of America's most powerful outboards and must absorb constant punishment without failing. Mueller Brass Co. has one of the world's largest automatic screw machine departments fabricating both ferrous and non-ferrous custom parts. Parts can be produced in an infinite variety of shapes and sizes from ⅛" to 3¼" in a wide range of free cutting and specialized alloys. Complete facilities are available for all secondary and finishing operations, as well.



INSERT DRIVE HUB INSERT BUSHING

THE MAN FROM MUELLER BRASS CO.

can give you sound, unbiased advice on the one best method of making your parts because Mueller Brass Co. is the only fabricator in the country offering all these methods of production. An experienced "Methods Analysis Department" has at its command a complete knowledge of the advantages and limitations of each production process. This unique technical service is your assurance of getting the best product at the best price . . . made the one best way.

FORGINGS

PLASTIC INJECTION MOLDING

MUELLER BRASS CO.

CO. METHODS · ANALYSIS · SERVICE

economical method of producing parts

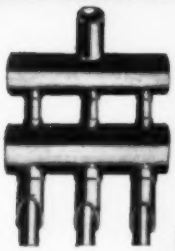
CASE HISTORY 226

COLD-PREST® IMPACT EXTRUSION for door closer cylinder

By producing this door closer cylinder as a Cold-Prest Impact Extrusion, several important advantages are realized: formerly made in three pieces, the part is now made as one piece in one operation which eliminates machining and assembly operations. The possibility of leakage is eliminated and the part has better physical properties, as well as a smooth, bright finish. Mueller Brass Co. has complete facilities for producing Cold-Prest impact extrusions of aluminum, copper, brass, bronze and steel. Square, rectangular and cylindrical shells up to 28" in length are possible depending on wall thickness and other design details. Parts can be designed having ribs, flutes, splines or bosses . . . with multiple wall diameters and with various wall sections.

POWDERED METAL PARTS

SAND CASTINGS



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Fine tools that encourage Good Work

ARMSTRONG WRENCHES

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

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If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

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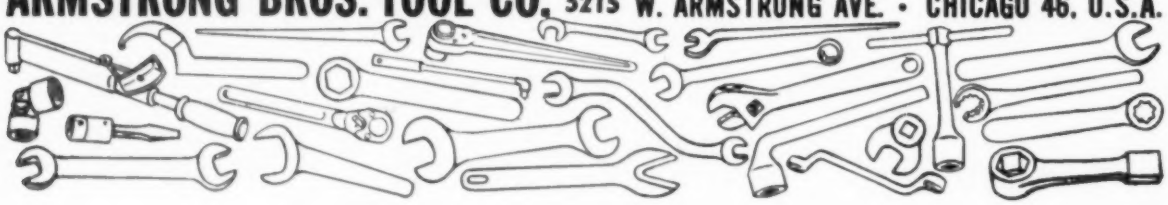
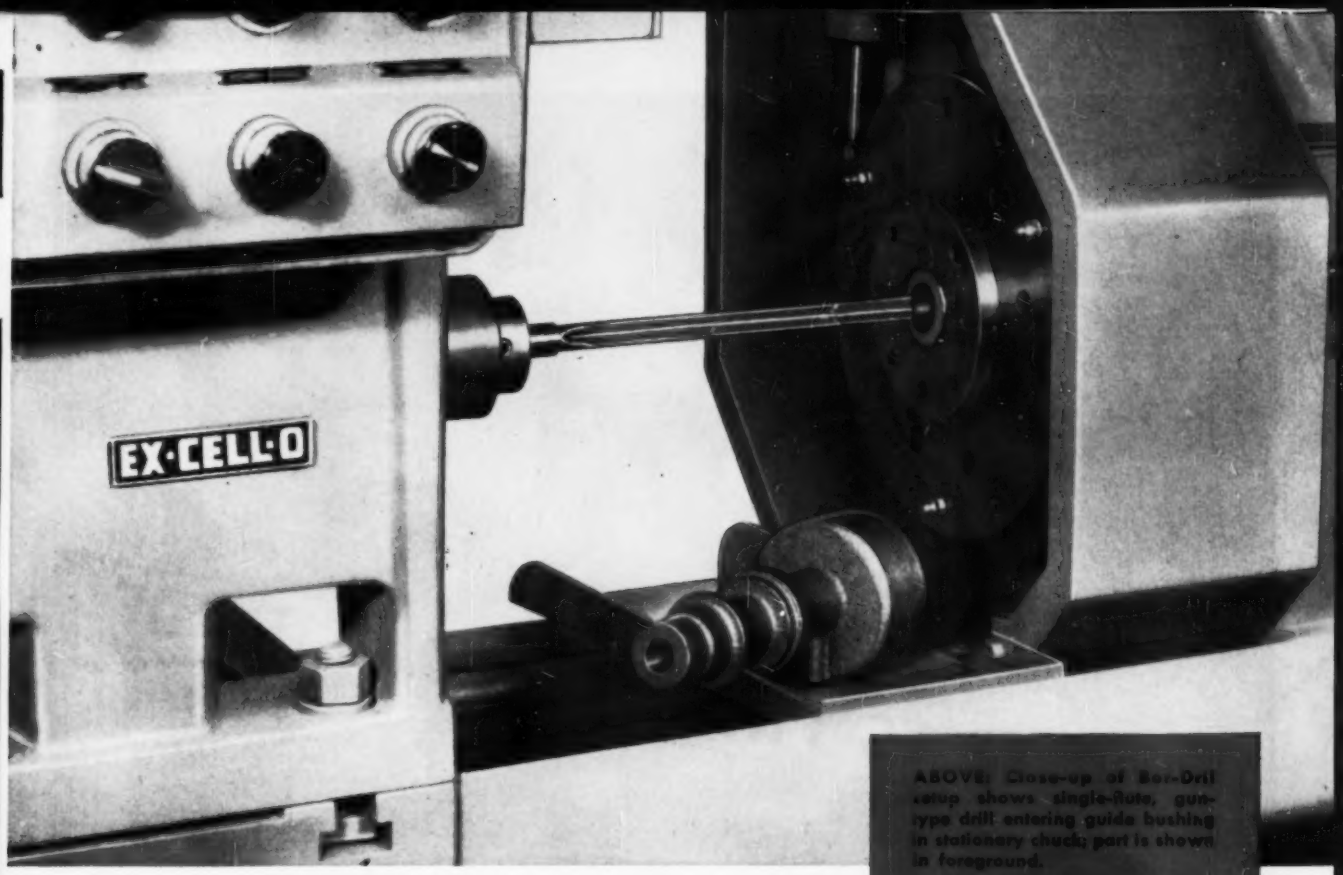




DEEP HOLES FROM THE SOLID, ROUND AND STRAIGHT WITHIN .0005"—

Bor-Drilled in 30 seconds!

A cast-iron automotive distributor base in high production requires a central hole 6⅞" deep by ⅝" diameter. Hold both concentricity and diameter to .0005" tolerance; finish the I.D. to 15 RMS or better. ***How many operations would you specify for the job—drilling, reaming, plus honing or lapping?***

Actually, your process sheet needs only one notation—*Bor-Drill!*

Bor-Drilling is Ex-Cell-O's method of producing accurate holes from the solid with standard or special Ex-Cell-O Precision Boring Machines. The process utilizes a rotating gun-type drill; chips are cleared out the single flute of the drill by high-pressure coolant oil fed through the Ex-Cell-O Precision Spindle.

Ask your Ex-Cell-O Representative about this faster, better way to get a finish-machined small hole 12" deep or more *in one operation.* Or write direct for a free descriptive booklet on Bor-Drilling.

ABOVE: Close-up of Bor-Dril setup shows single-flute, gun-type drill entering guide bushing in stationary chuck; part is shown in foreground.

BELOW: Cutaway of part reveals quality finish of Bor-Drilled hole.

BOTTOM: Equipped for Bor-Dril operation, Style 112-D Precision Boring Machine precision-finishes long hole from the solid in 30 seconds.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

XLO

Machinery Division

59-22

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 239 READER SERVICE CARD

30% TO 50% LONGER LIFE FOR RESINOID-BONDED DIAMOND WHEELS

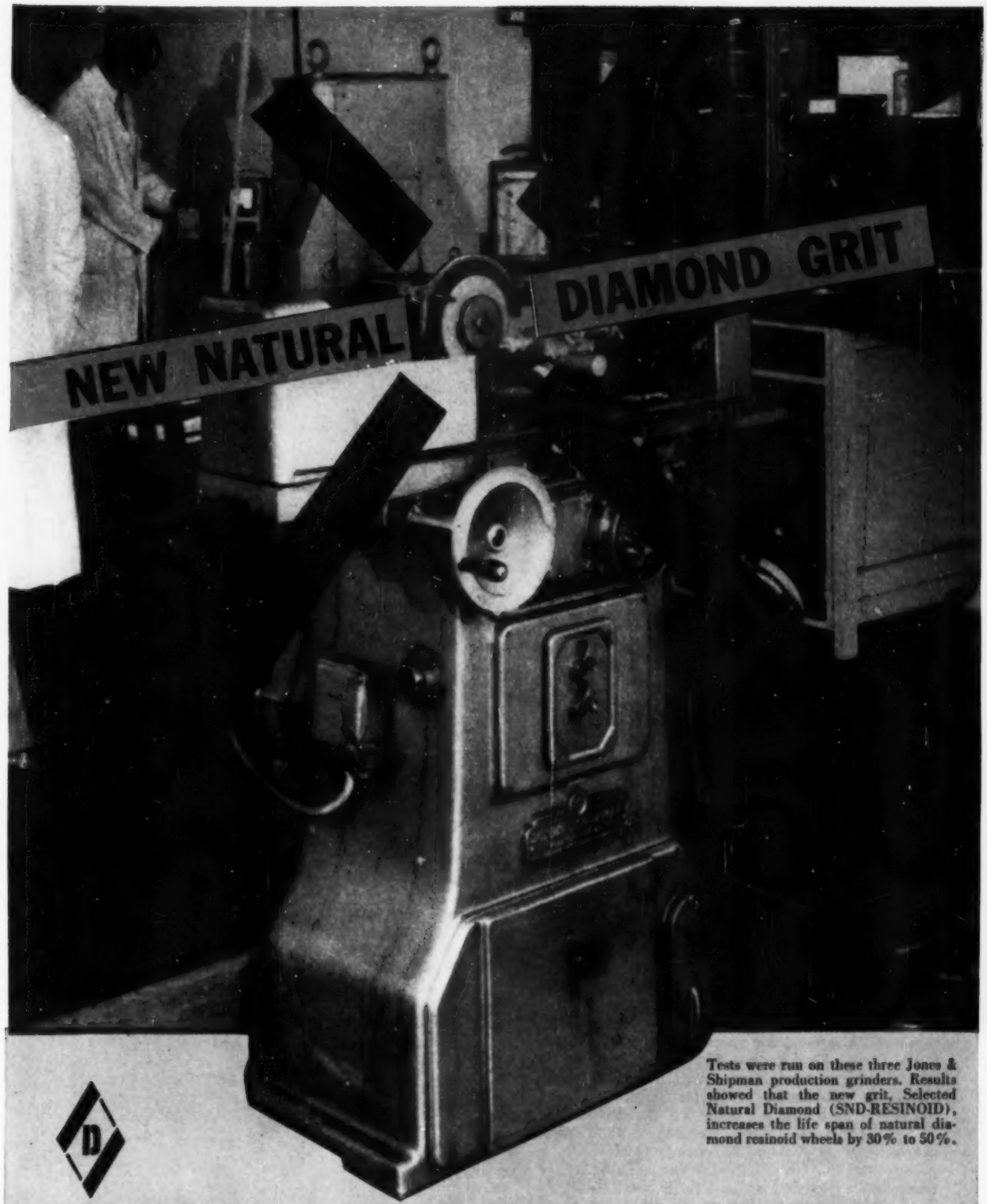
Six hundred separate trials, using 145 wheels, were run by the Diamond Research Laboratory to test a completely new type of natural diamond grit for resinoid wheels. The results: this new grit increases the life of natural diamond resinoid-bonded wheels by 30% to 50%.

The particles of this new grit do not readily pull out of the bond. Instead, they break down into ever-finer fragments which constantly expose new, sharp cutting surfaces.

TEST EQUIPMENT: Three 18" Jones & Shipman production grinders were fitted with special spindles to enable wheels to operate at 5500 surface feet per minute, the speed generally used in diamond grinding.

The wheels were of the D1A1 type, 6" in diameter, 3/16" face width, with 1/8" depth of resin. Each wheel contained 31 1/4 carats of the new grit. Metal to be ground was tungsten carbide of the same quality normally used for milling cutters, lathe tools, etc. During the course of the tests, 700 pounds of hardest carbide were ground away.

RESULTS: This new friable grit, Selected Natural Diamond (SND-RESINOID), increases the life of natural diamond resinoid wheels by 30% to 50%, depending on the type of job at hand. The grit will be available to your wheel manufacturer soon. Next time you order diamond resinoid wheels, specify SND-RESINOID . . . the most economical *and* the most efficient grit you can use.



Tests were run on these three Jones & Shipman production grinders. Results showed that the new grit, Selected Natural Diamond (SND-RESINOID), increases the life span of natural diamond resinoid wheels by 30% to 50%.

INDUSTRIAL DISTRIBUTORS (SALES), LTD.

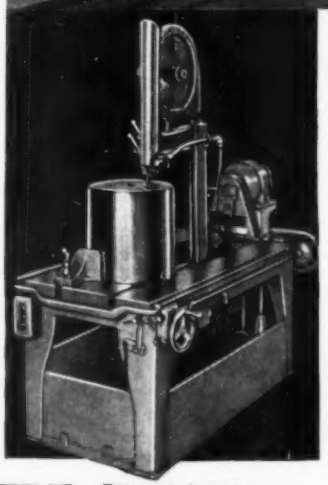
YOU CAN DEPEND ON NATURAL DIAMONDS

MARVEL NO. 8 BAND SAW makes a tough job EASY...

FLOOR TO FLOOR IN 5 HOURS... no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.



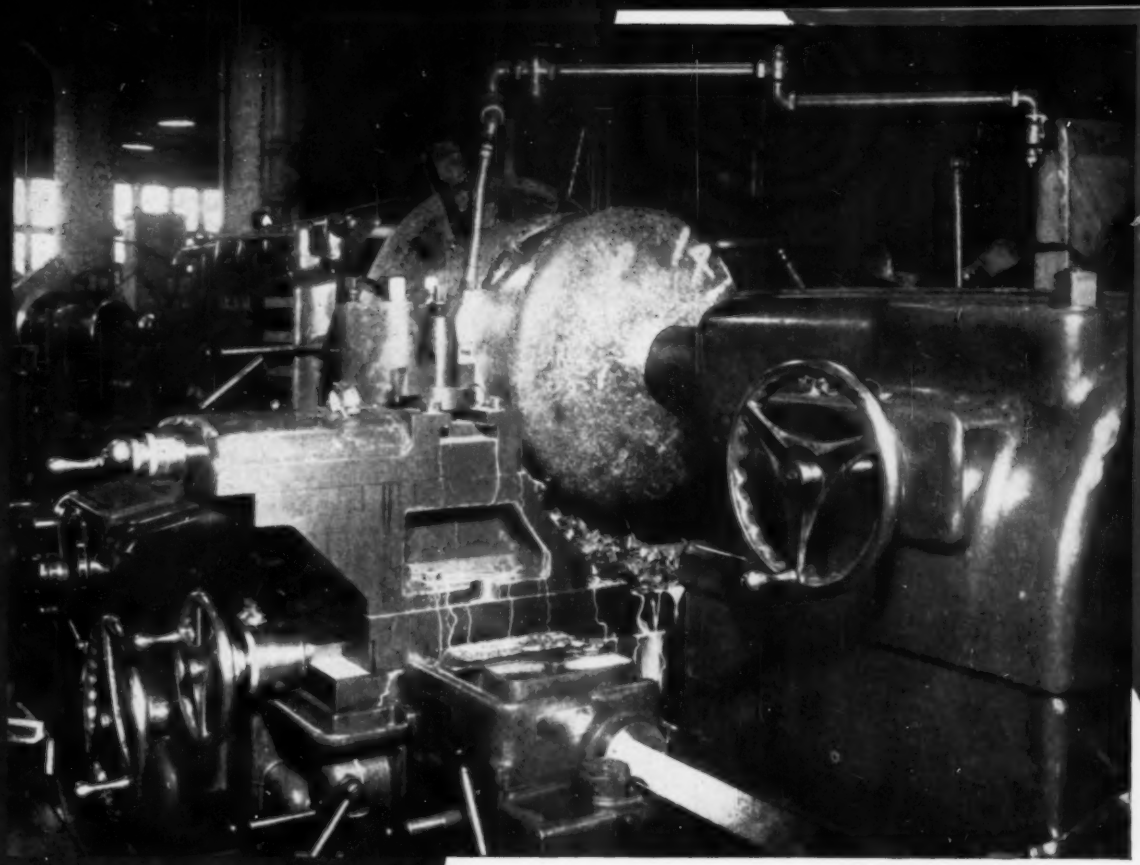
Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

S-1302

CIRCLE 243 READER SERVICE CARD ►



"AMERICAN"

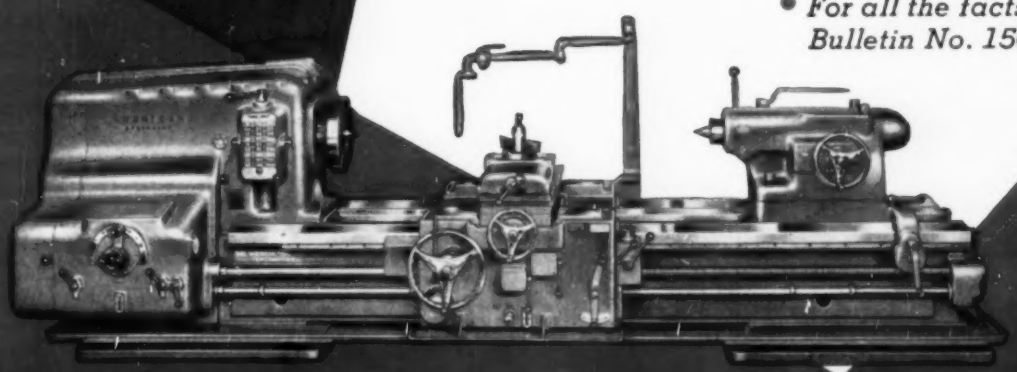
"Scalping" a $12,000 TITANIUM Ingot...

The operation shown by the accompanying illustration is "scalping" (cutting) the hide off of an ingot of pure titanium sponge. The ingot is 25" in diameter and the skin or hide that must be turned off is from ½" to 1" thick.

Due to the terrific cutting resistance of this "hide" low cutting speeds and exceptional ruggedness and rigidity are essential to satisfactory tool life.

Because power, rigidity, ruggedness and inherent stamina are outstanding characteristics of "American" Pacemaker Lathes they have been selected for this severe service by all of the major titanium fabricators.

• *For all the facts ask for Bulletin No. 150.*



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

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for fast, dependable service on

- **hand hack saws**
- **power hack saws**
- **band saws**
- **hole saws**
- **hammers**
- **ground flat stock**

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INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

for fast, dependable service on all your industrial needs.

Patronize the Distributor who displays both.

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Heat-treating code

Dear Sirs:
We were very much interested by the article, "Heat-treating control cuts reject rate" (*AM*—April 6 '59, p138).

We are especially interested in Brown & Sharpe's Heat Treatment Code Book. Can you tell us the name of the publisher and the price? We would like to purchase a copy if the book is available.

C E Sherman
Coventry, England

The Heat Treatment Code Book has not been published for general distribution.

Brown & Sharpe Mfg Co collected the data for its own use and has distributed the information only within the company—Ed.

New Standards

Dear Sirs:
You recently ran an article entitled "Overhaul JIC hydraulic standards" (*AM*—May 4 '59, p96).

We would be very interested in getting a copy of the revised JIC symbols mentioned in this article.

If there is any charge, please make the billing for my attention.

W F Meinert
Aurora, Ill

For information on securing a copy of these revised symbols, write to Mr R R Mitchell, Production Engineering Section, General Motors Corp., Detroit, Mich—Ed.

More on Whitworth

Dear Sirs:
I believe the author of your article, "Whitworth was only partly right" (*AM*—Apr 20 '59, p112) is quite unjust to Whitworth. He has jumped to the conclusion that Whitworth was oblivious to the possibility of "wind" or twist in the surfaces of three plates vitiating his method of working them together in pairs in order to true their surfaces.

Records of Whitworth's work indicate that his earlier surface plates were indeed oblong. Even so, why should Mr Rahn conclude that Whitworth compared them together (with coloring matter between them) only in such a

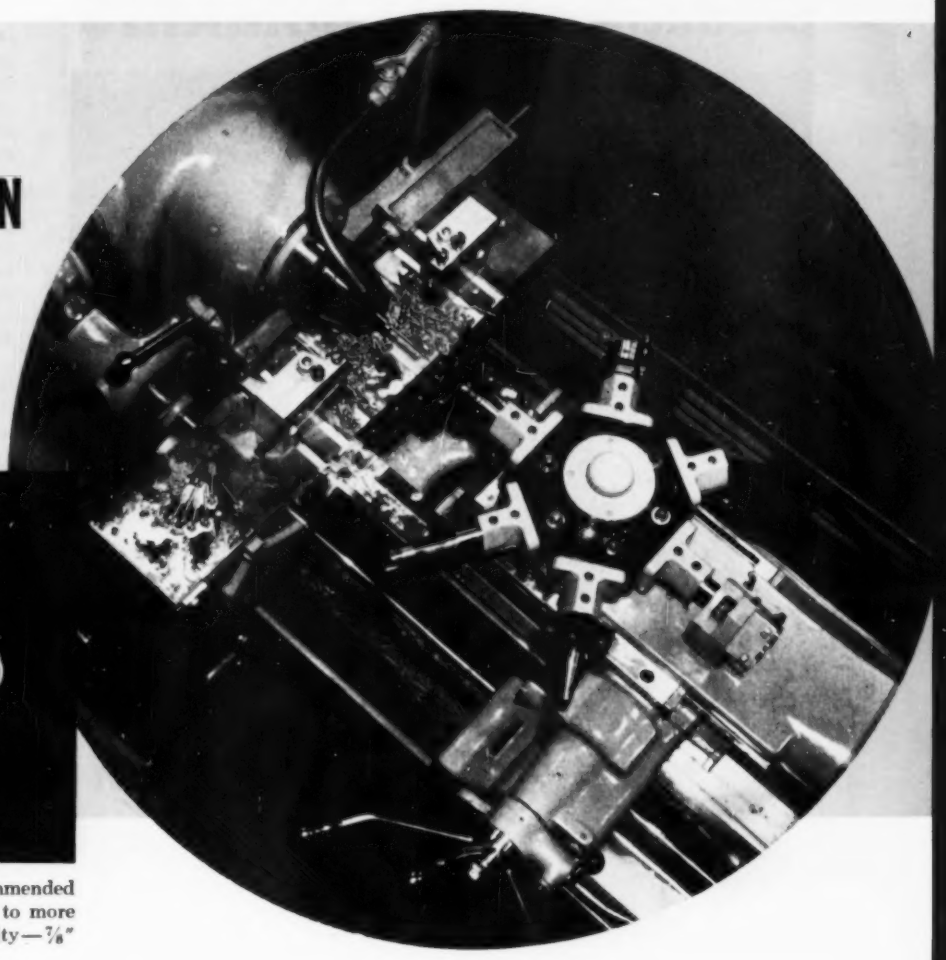
SHOPMATES

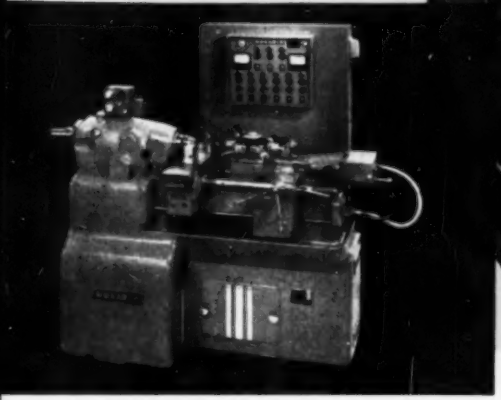
N. Jarvis

IT'S THE SAME THING EVERY MORNING — THE EMERGENCY COT LOOKS LIKE THE WHOLE NIGHT SHIFT SLEPT IN IT!!
NO BODY EVER REPORTS BEIN' SICK AT NIGHT..... THE WHIP WILL SURPRISE 'EM SOME NIGHT — THEY'LL WISH THEY WAS SICK!!
EMERGENCY
FIRST AID ONLY
N. JARVIS

Don't Tool Up for Tomorrow's Boom with Yesterday's Lathes

MONARCH HIGH PRODUCTION LATHES OF TOMORROW





The Model B Speedi-Matic—recommended for lots ranging from less than 25 to more than 2500 pieces. Bar stock capacity—⅞"

5. The New Model B Speedi-Matic... A Fast, Precision, Hand Screw Machine

Speed and accuracy of output have always typified the Monarch Speedi-Matic. Now with the latest developments in electronic speed control, a hydraulically powered turret and a host of other improvements, the 5 H.P. Model B is even better adapted to today's exacting requirements. Major features include:

(1) A control center that provides preselected, automatic speed and feed change for each tool position. Speed range is infinitely variable from 40 to 4000 R.P.M.; feed range, infinitely variable from ⅛" to 16" per minute. You get the most efficient speed and feed for each operation, consequently maximum production.

(2) A power feed, ram type turret, the turret head of which is hydraulically indexed, hydraulically located in the new position to an accuracy of less than .0002" and hydraulically clamped in position. It is also automatically lubricated.

(3) A feed box, powered by an electronically controlled feed motor.

(4) A powerful, lever operated, self-centering cut-off and forming slide that moves on preloaded ball bearings and carries its own forced feed lubrication system.

(5) Electrical controls to J.I.C. standards. The spindle and feed control elements are in the form of plug-in modules for ease of maintenance.

(6) Simplicity of setup to the degree that the time is regained during production of the first few pieces.

If one of your problems is the economical production of precision screw machine parts in small and medium size lots, then the Model B Speedi-Matic is for you. It will take only a few moments of your time to write for full information. . . . The Monarch Machine Tool Company, Sidney, Ohio.

Monarch

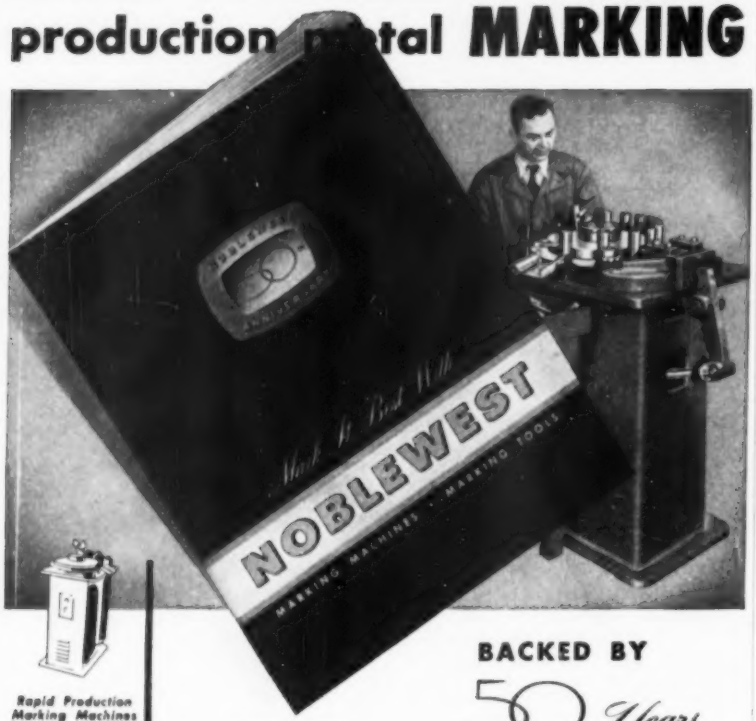
ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

CIRCLE 245 READER SERVICE CARD

NEW GUIDE to modern production metal MARKING



Rapid Production Marking Machines

General Purpose Marking Machines

Precision Marking Dies

Automatic Numbering Heads

BACKED BY

50 Years

Experience

AS MASTERS OF METAL MARKING

For half a century NOBLEWEST has been solving industry's marking problems . . . designing and building equipment for faster, better, *permanent* marking of metal products at lower cost. NOBLEWEST is the originator of the *Roll-Marking Process* and many other innovations in rapid production metal marking. In this, our 50th year, we derive great satisfaction from the knowledge that more and more leaders of industry continue to bring their marking problems to NOBLEWEST.

May we send you a copy of our new catalog containing the complete NOBLEWEST line of MARKING MACHINES and MARKING TOOLS? Just send us your name and title on your company letterhead.

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MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

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ORIGINATORS OF THE ROLL MARKING PROCESS

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manner that their oblong shapes coincided?

I think it would be much more reasonable to think that Whitworth, like any skilled mechanic, would have tried his plates together in several relative positions with the express purpose of avoiding the pitfall which Mr Rahn mentions.

In any case, I have seen it in print that Whitworth also made use of a straightedge as part of his procedure in working up three plates and thus anticipated by many years the suggestion put forward by Mr Rahn.

Further, it is also on record that, in his later work on the perfection of surface plates, Whitworth made them of hexagonal shape. (A set of such plates is still preserved at the Institution of Mechanical Engineers in London.)

Surely it is going too far to think that, in working up such hexagonal plates, Whitworth would not have tried them together in several relative positions. As Mr Rahn mentions in his article, with square plates the natural thing is to try them together in at least two relative positions at right angles.

I would mention that some forty years ago when I first devised the method of testing surface plates with a sensistive level or an auto-collimator, I appreciated the necessity of checking for wind across the two diagonals. I saw the possibility of a plate being far from flat if tested only along a rectangular pattern of lines.

The type of straight-edge comparator illustrated in the article is not novel. I introduced it at the N P L many years ago, and it has been available for some time from one of our most prominent manufacturers of cast iron and granite surface plates.

Fred H Rolt
Hampton, Middlesex, England

"Pay day!"

CALENDAR

Pressed Metal Institute—National Meeting, Sept 13-17, Stanley Hotel, Estes Park, Colo.

Society of Automotive Engineers—Farm, Construction, and Industrial Machinery Meeting and Display, Sept 14-17, Milwaukee Auditorium, Milwaukee, Wis.

American Die Casting Institute—Annual Meeting, Sept 15-17, Edgewater Beach Hotel, Chicago, Ill.

Instrument Society of America—Instrument-Automation Conference & Exhibit, Sept 21-25, Int'l Amphitheater, Chicago, Ill.

American Welding Society—National Fall Meeting, Sept 28-Oct 1, Sheraton-Cadillac Hotel, Detroit, Mich.

Society of Automotive Engineers—National Aeronautic Meeting and Display, Oct 5-10, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers — Semi-annual Meeting, Oct 8-10, Chase-Park Plaza Hotel, St Louis, Mo.

American Society for Testing Materials—Pacific Area National Meeting, Oct 11-16, Sheraton Palace Hotel, San Francisco, Calif.

Magnesium Association—Annual Convention, Oct 19-20, Hotel Roosevelt, New York, NY.

American Institute of Electrical Engineers—Machine Tool Conference, Oct 19-21, Hotel Cleveland, Cleveland, Ohio.

American Machine Tool Distributors Association — Annual Meeting, Oct 25-27, Statler Hotel, St Louis, Mo.

American Gear Manufacturers Association — Semi-Annual Meeting, Oct 25-28, Edgewater Beach Hotel, Chicago, Ill.

American Society for Metals—National Metal Exposition and Congress, Nov 2-6, International Amphitheater, Chicago, Ill.

National Tool & Die Manufacturers Association — Annual Convention, Nov 4-8, Statler-Hilton Hotel, New York, NY.

you change Only the Rolls in a Reed Thread Rolling Attachment

WHEN YOU CHANGE FROM STRAIGHT THREADING

9/16—12 UNC

TO TAPER THREADING

3/4—14 NPTF

no other equipment is needed and the change is quickly made by simply removing the roll spindles and inserting new rolls.

Each Reed Standard Series B Attachment rolls a complete range of thread sizes—both straight and taper. Adjustable roll pin support arms provide a simple adjustment for this full capacity range.

Write for your copy of Thread Rolling Attachment Bulletin B-2 for helpful information on Thread and Form Rolling

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CIRCLE 247 READER SERVICE CARD

Melting furnace at Calumet & Hecla, Inc.—Wolverine Division, where Shell Irus Fluid 902 eliminates the danger of hydraulic line fires.

Ready... aim... NO FIRE!

Take 10 high-temperature alloy-melting furnaces, hydraulically operated—each pouring 1500 lbs. of molten metal every hour in close proximity to "live" hydraulic lines—and you can readily see why selection of hydraulic fluids is important to Calumet & Hecla's Wolverine Tube Division.

Now the operation is made more reliable by the use of Shell Irus Fluid 902, a water-in-oil emulsion type fluid. Irus* Fluid was C & H's choice, after carefully studying other commercial hydraulic fluids—for many reasons:

1. Irus Fluid will not support combustion.
2. Irus Fluid has excellent lubricating properties.
3. Irus Fluid has hydraulic efficiency and equipment compatibility.
4. Irus Fluid is economical, costing about one-third less than other fire-resistant fluids.
5. Irus Fluid's bright yellow color makes it easy to spot and trace leaks.

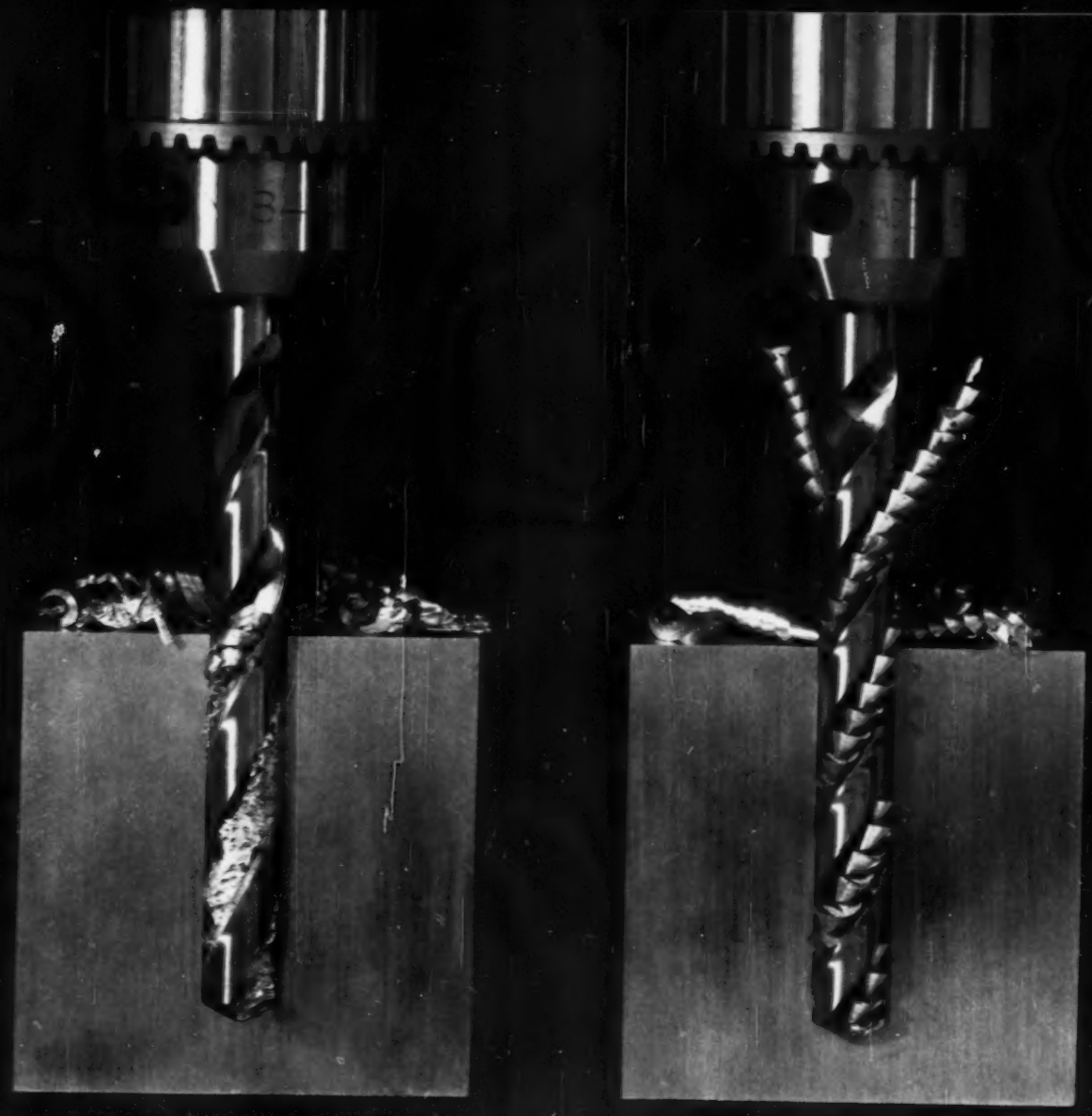
In plant after plant, operators find that these advantages assure maximum safety to both personnel and equipment.

If you have a hydraulic line fire hazard, we suggest that you have the Shell Industrial Products Representative show you the many advantages in Irus Fluid 902; or write to Shell Oil Company, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif. In Canada: Shell Oil Company of Canada, Ltd., 505 University Ave., Toronto 2, Ontario.

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

SHELL



BEST FOR THE PURPOSE

Ever have trouble with chip removal, where the chips fused to each other and to the drill in a continuous spiral plug?

If you have you'll appreciate GTD-AMPCO Fast Spiral Drills, especially designed for drilling in aluminum and other ductile materials whose chips have a tendency to "pack" in the drill flutes. The "fast" spiral supplies more chip room and has a tendency to draw the chips out with a "lifting" action. The greater angle also provides more rake for freer cutting.

There is a best drill for every purpose. GTD-AMPCO makes them all.

May we discuss them with you?

GREENFIELD TAP & DIE

GREENFIELD, MASSACHUSETTS

HOLD IT WITH A HORTON

Round, square, hexagonal, or what shape have you. HORTON Independent Chucks with reversible jaws will hold it with a four jaw grip that's positive, true and reliable. A precision chuck for precision machining.

Capacities from 4 inches to 36 inches, in all standard mountings. Special chucks to 66".

HORTON, to be sure . . . .To be sure, HORTON

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SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

GEOMETRIC—HORTON NEW HAVEN 15, CONNECTICUT

SPOT NEWS...

- **A five-year cycle has been at work for some time in the auto industry,** one authority points out. In 1950 car and truck assemblies hit 8 million for the first time. Five years later (after smaller output in the intervening years) they rose to a new peak of 9 million. In 1960 they are likely (after four years of so-so performance) to peak again at 8 million or higher.

- **Russians have come up with a steelmaking method** they claim may make rolling mills obsolete: Semi-finished rolled metal of any given shape is being produced directly from the liquid state without rolling mills at a pilot plant.

- **It's reported that more than 50,000 tons of European steel** have come into Chicago alone since the first ship came down the St Lawrence Seaway May 4.

- **Congress's Joint Economic Committee is about to get into some hot issues:** (1) whether the U S is pricing itself out of world markets, (2) effects of present tariffs on export-import controls, (3) impact of the European Common Market on U S business, and (4) a top-to-bottom comparison of U S and Soviet Russia's economies.

- **Permanent magnets are being used for true positioning of mass-produced work** on any power tool. Austrian-developed method has a circular magnet which carries a cylinder (with inner threads) in its center. Cylinder is drilled in a horizontal position to allow placing of a warp-proof steel indicator transversely through the threaded part. A vertical bolt presses the indicating needle into place.

- **Experimental aluminum roof is being tested on a Lincoln Continental** by Ford's Advanced Engineering Dept. Roof is completely fabricated and trimmed before installation. Aluminum extrusions are used for roof rails, windshield header and back window frame.

- **ENIMS, Russia's machine tool design organization, is under fire** from Soviet newspapers. "Educated goldbrickers," said one, "are taking cover in the supposed complexity of the problems they are supposed to solve." Recommended by *Izvestia:* Put experimental work on a cost-accounting basis and remove all engineers "who are simply husks."

- **Look for stamping job shops to increase their prices** as soon as the steel strike is settled. It's expected they'll tack 2% onto any steel-wage-caused price increase that's passed along to them. General metalworking job shops, too, are expected to up their prices—mainly because more and more engineering and precision work is needed to fill orders.

- **USSR now has an auto assembly line conveyor that is speed regulated** to coincide with ups and downs of workers' physical conditions during workday. For instance, conveyor speed is highest at 8 am, slows to a low point at 10 am, speeds up gradually until lunchtime, after that slows up gradually and drops sharply at 3 pm, then picks up gradually until 5 pm.

- **Some 160 to 180 gray iron foundries closed down permanently** during the recession, the Gray Iron Founders' Society estimates. That's more than went out of business in the two previous years combined.

- **About $3.2 million worth of textile machinery will be sold to the USSR** by Whitin Machine Works, Whitinsville, Mass—Whitin's first contract since 1930 with Russia. Also ordered by the Russians: $250,000 worth of looms for a carpet factory from Crompton & Knowles Corp, Worcester, Mass.

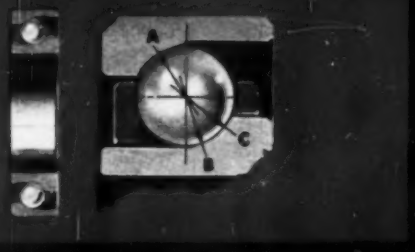
EX-CELL-O SPINDLES

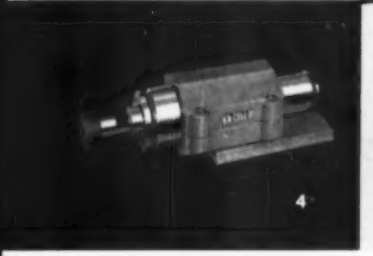
RUN TRUE

1

2

3

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5

1. High-frequency, 25,000 rpm motorized type.
2. Cutter grinder model; 3600 rpm inbuilt motor.
3. Vertical units fit many power requirements.
4. I.D. type adapts to most machines.
5. Form grinder spindle; 25 h.p. capacity.

Cross-section drawing (above right) of single-row bearing shows points of ball contact (A, B and C) on tracks in race.

59-27

EXCLUSIVE RADIAL THRUST BEARING DESIGN PUTS PRECISION INTO PRODUCTION GRINDING

What makes Ex-Cell-O Precision Grinding Spindles run true? Engineering experience, skill in precision production and assembly, quality materials—and perhaps most important, the famous Ex-Cell-O Precision Spindle Bearing!

Made by Ex-Cell-O for use only in Ex-Cell-O Spindles, this custom-made bearing is the product of a unique Ex-Cell-O process which develops tracks or pathways in the race. The ball contacts the race only at these narrow, mirror-smooth bands (see detail above).

As a result, the bearing runs cooler at high speeds; wear is reduced, rigidity is improved, and spindle accuracy is measurably increased.

In widespread original equipment use, Ex-Cell-O Spindles are also an economical means of increasing speed and accuracy in older I.D. or O.D. surface and thread grinders, tool and gear grinders and similar equipment.

See your Ex-Cell-O Representative, or write direct for details on the complete line of Ex-Cell-O Precision Grinding and Boring Spindles.

EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

XLO Machinery Division

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 251 READER SERVICE CARD

WASHINGTON...

Push for more subcontracts . . .

The Defense Dept is being pressured to tighten up procurement policy as a means of spurring greater subcontracting to small business. Proposals call for tougher requirements on prime contractors to let subcontract work to smaller firms, and the establishment of specific dollar volumes of subcontracting to be awarded.

Under present policy there are no hard-and-fast requirements on subcontracting—the policy is on the "exhortatory rather than mandatory side," as one Pentagon official puts it. Primes are required only to "make the maximum practicable utilization" of small businesses for subcontract work. For the most part, the subs are selected by the primes and deal directly with them rather than with procurement agencies.

There's a more formal arrangement with some 250 of the larger primes and major subs, under which the companies have set up special small business subcontracting procedures. But there's no provision for a guaranteed level of subcontracts. Under this scheme, the Defense Dept reports that $3-billion worth of subcontracts were awarded last year to small firms. The figure is based on reports from 291 companies and represent about 17% of their total military contract receipts.

The push for more subcontracting comes from some of the industry men who sit on the Defense Dept's Small Business Advisory Committee. The group met recently in closed session with top Pentagon procurement planners.

Anti-inflation, steel . . .

. . . and the administration are all wrapped up together as the steel wage negotiations come to the end of the two-week strike truce.

The White House is, of course, a big factor in the steel negotiations, as was demonstrated by the working out of the letters exchanged by Dave McDonald and President Eisenhower. All this came, of course, within only a few days of Eisenhower's reassertion of his stand that the federal government should keep its hands off negotiations at a time when no national emergency is involved.

Actually, Secretary of Labor Mitchell, who has kept in close touch with the negotiations all along, willingly went along with Dave McDonald's request suggestion that the Steelworkers would agree to a truce if the President would agree to back such a truce in a letter.

The steel company officials had to go along, they felt, although they made no secret of their conviction that they'd rather the government—or any third party—stay out of the situation.

The strike deadline . .

. . . postponement, the experts say, works to the disadvantage of the steel companies, and demonstrates pretty much that both the steel companies and the Steel Workers know that the companies have the upper hand.

The steel companies generally feel that they can't lose by taking a tough stand on wage increases. This gives them their best chance for (1) a small increase that they may be able to absorb or (2) passing along an increase if the Steel Workers finally go out on strike.

The Eisenhower administration understands this—and Secretary of Labor Mitchell, with the very real assistance and support of Vice President Nixon, is trying his best to do what he can to arrange a settlement that won't result in a strike or a price increase.

Nixon is leading . . .

. . . the administration's drive against inflation. One of the first signs is the report of his Cabinet-level committee, which is doing what it can to make the fight against inflation the number one political issue next year. Nixon thinks it can be a winning issue in his run for the nomination—and the White House—if he is the candidate.

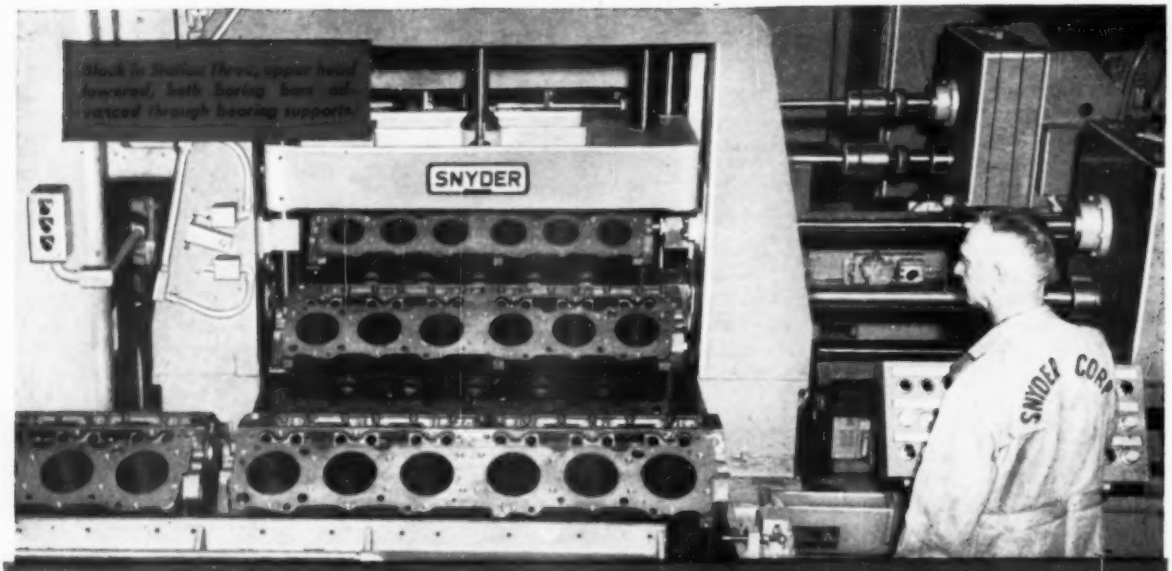
The theory is that ever since the depression, the Democrats have made fighting a depression their basic economic policy. Now the Republicans are hoping that Nixon can give the GOP an anti-inflation trademark that will appeal to next year's voters.

Nixon's committee will be putting out a series of documents on such things as tax-reform, administered prices, union power, government regulation of industry, and U.S. competition for foreign markets.

Later, Nixon's group will schedule public hearings—not to gather evidence, but to publicize its findings and Nixon hopes, influence public opinion.

Nixon puts great store in increasing productivity as a way of countering inflation. A study of productivity trends has been scheduled, and a public hearing on the subject is likely, with Nixon in charge.

Nixon doesn't expect he or his group will have anything new to say about the economics of inflation—but there is still plenty to say about the politics of a steady rise in the prices of things consumers and businessmen have to buy.



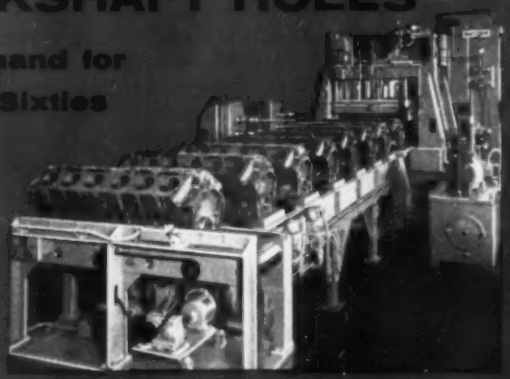
PRECISION BORING OF 42" LENGTH CAM AND CRANKSHAFT HOLES

SNYDERIZING Meets the Demand for Quality Parts for the Soaring Sixties

This 12-cylinder block is for heavy duty truck and marine engines aimed at taking a bigger bite of this booming market. Our Snyder special 7-station machine is helping this manufacturer SNYDERIZE for the Soaring Sixties by providing boring tolerances which make his product outstanding.

In regular production at a rate of 31 pieces per hour, main and camshaft bearing holes are rough and semi-finish bored simultaneously with all diameters held to manufacturers' specifications for alignment, roundness and concentricity. The distributor hole is also semi-finish bored in this machine to establish proper location to cam and crank bores.

Advanced engineering, both in product and production machines, is the best possible preparation for the competition of the next decade. We'll be happy to show you, too, how to SNYDERIZE for the Soaring Sixties to gain more efficient parts handling, gaging, assembly and machining. Write or phone for new brochure on machines for profit improvement.



Standard Features of Snyder Machines

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3. Automatic lubrication.
4. Walking beam transfer bar.
5. J.I.C. Standards throughout.
6. Electrical interlocks and full depth circuit throughout.
7. Panels equipped with SNYDER CIRCUIT SLEUTH.

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(Formerly Snyder Tool & Engineering Company)

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DETROIT...

Changeover near...

The best June since 1955 brought the passenger total for calendar 1959 up to 3,240,000 units, a figure almost exactly 1,000,000 larger than last year's count.

Production is expected to dip slightly to 530,000 units in July and then will be slashed by half in August, when makers changeover to 1960 models. Official optimism on fourth-quarter output is reflected by Ford Economist George P Hitchings, who predicts that total new car sales for 1959 will exceed the six-million mark by at least 3 to 4%.

Boom in diesels...

General Motors' Detroit Diesel Div, unaffected by annual model changeover problems, is turning out horsepower at a pace 81% ahead of last year. General Manager Clyde W Truxell expects to double 1958's output by year's end. He attributes the sharp increase to strong sales of road-building equipment, as well as the constantly climbing marine market.

Another boost stems from continuing gains by GMC, which uses these engines exclusively in its diesel trucks and coaches. GMC has produced 46,841 trucks so far this year, compared to 31,684 for the same 1958 period.

Component trends...

Not so many people as was first expected will have a chance to own a greaseless car in 1960. Ford's small Falcon, the intended guinea pig, will bow with grease fittings at the usual places instead of "Teflon" lube-free bearings. Initial usage now seems confined to the Thunderbird and partial installation on V-8 Ramblers.

Although too late to affect most 1960 plans, a new 7-inch headlamp unit has been developed cooperatively by lamp and vehicle manufacturers and approved for use by all of the 49 states and the provinces of Canada. Its performance for all practical purposes is as good as the more expensive dual installation, so stylists, now finishing 1961 models, will have more leeway in their designs. Savings per car of a single over a dual installation can amount to as much as $3.50 to a manufacturer.

In that elusive field of smog control, Chrysler Corp. and Thompson-Ramo-Wooldridge have joined forces to design size and heat out of the latter's catalytic muffler. (T-R-W's original design works, but is impossibly bulky, would cost about $385 to install, and the after-burner on it toasts the feet of rear seat passengers). Ford Motor Company, with a design that uses vanadium pentoxide to neutralize the smog causing exhaust particles, seems furthest ahead. These units are currently being proving ground tested by the Big Three with a goal of a $50 unit cost and a 25,000 mile life cycle.

And at the Corps of Engineers' Detroit Arsenal, a dedicated civil servant named M G Bekker is about ready to demonstrate to doubting builders of off-road equipment that a jeep equipped with Model T type clincher tires will pull through soft mud or sand far more effectively than a standard model. Bekker also found that removal of two out of every three cleats in tractor tracks increased drawbar pull by a startling 180%.

Now the "Mutt"...

You may remember that "Jeep" started as a contraction for general purpose vehicle. Now we have its successor, the "Mutt," which stands for military utility tactical truck.

Ford's $15-million contract for 4050 of these is the reward that followed over eight years of research and engineering effort. The lightweight vehicle will be assembled at the company's Livonia (Mich) transmission plant, with subcontracts for all components going to about 65 outside suppliers.

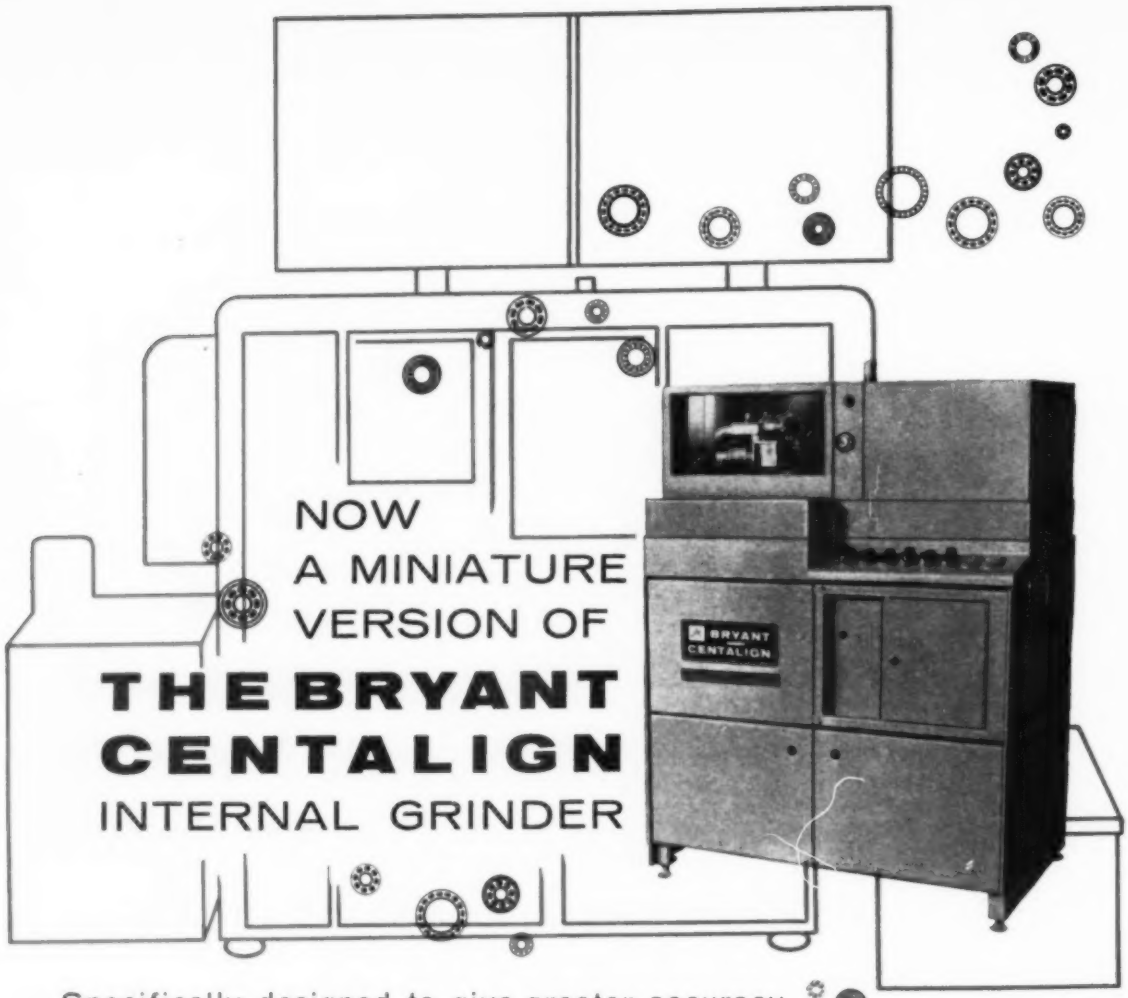
About 85% of the service parts for the "Mutt" have been designed to be interchangeable with what ultimately will be a family of trucks which will include ¾ and one-ton models.

Mutt is about 400 lb lighter, has a higher power-to-weight ratio, 30% more cruising range on the same fuel load, and rides more softly than the Jeep. It weighs 1600 lbs less when rigged for air drop, and requires 5½ man-hours less time to prepare. It is 6 inches shorter than the Jeep, but has 26% more cargo room.

Mitchell-Bentley Corp will supply the unitized steel bodies. Continental Motors Corp contributes the 4-cylinder, 247-lb engine, and Borg-Warner Corp the transmissions.

Other suppliers who will be tooling for major components: Firestone Steel Products—front suspensions; Kelsey-Hayes—brakes and drums; B F Goodrich—wheels; Thompson Products—steering linkage; and Means Stamping Co—miscellaneous stampings.

Meanwhile, Jeep-making Willys Motors is hardly starving. It has just received a $2.5-million military assistance program order to supply Turkey's armed forces with 1600 vehicles.



NOW A MINIATURE VERSION OF THE BRYANT CENTALIGN INTERNAL GRINDER

Specifically designed to give greater accuracy, speed and flexibility in the production of miniature bearings

The Bryant Miniature Centalign Model B brings new efficiency and accuracy to the grinding of bores and internal ball tracks in miniature and instrument bearing races. This new grinder is extremely compact, requiring only 8¼ square feet of floor space — half the space required by machines currently in use.

The exclusive Bryant feature of interchangeable "packaged tooling" allows set-up away from the machine, and results in almost uninterrupted machine production. Long periods of downtime usually required to retool for work part changes are eliminated.

Other time — and — money saving features include:
**Automatic New Wheel Dressing* — New wheels automatically dressed to correct size for maximum wheel life.
**Selective Skip Dressing* — Flexibility in cycling to suit job requirements.

Here is the answer to demands for faster, more accurate bearing production! Write now for complete details.

BRYANT Chucking Grinder Co.

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AIRCRAFT and MISSILES...

TRENDS

Atlas ICBM delay...

Atlas test launchings have been halted following five consecutive fizzles with the missile's "D" series. This is the job lot representing the final engineered design prior to production of operational models. Pentagon officials say the test firing failures did not result from any "fundamental design problems."

They put the finger, instead, on a "series of tough little breaks" which they claim are commonplace in final design stages of missiles. They say the stress on serviceability in the final design stage, prior to building operational models, introduces a "new set of variables."

Telemetry readings have shown pressure losses, malfunctioning valves, transient signals in the guidance, minor structural problems, and other minor mechanical difficulties. All Atlas vehicles now in the flight test stage are undergoing necessary retrofits. Test launchings are expected to resume within a month and the first operational model is set to be ready at Vandenberg AFB in two months—at least two months behind the initial target date.

All along, many Pentagon experts have been skeptical about the original July 1 objective for initial operational capability. The target date was set under Congressional pressure, the critics say, and to meet it Convair was forced to "under-design" the "D" series.

Turndown on A-plane...

Washington has once again ruled against construction of a prototype nuclear-powered airplane to achieve an early first flight. At the same time, a reorientation of the development program has been ordered—placing the stress on "advanced concepts" in both the GE direct-air open-cycle and the Pratt & Whitney indirect closed-cycle propulsion systems.

In essence, this means research for new materials capable of higher performance than materials used in present designs.

The new decision could result in a revised allocation of funds between the competing power plant contractors. Right now, GE gets a considerably larger chunk of the project's $150-million budget than P&W.

Behind the latest decision was a basic philosophical difference between the administration's scientific advisers and the engineers responsible for the A-plane program.

The engineers' view—as argued by the Air Force and AEC Chairman McCone—was to build a prototype plane, get it up in the air as soon as possible, and test out what has already been developed, even though it is a primitive design capable of only limited performance.

The scientists' view—represented by the President's Scientific Advisory Committee, headed until recently by Dr James Killian—is to hold off on prototype construction as long as significant improvements in technology and design appear attainable.

Challenge of space...

NASA has just printed what it calls a "technical introduction to space"—a 48-page booklet that provides a simply illustrated, easy-to-read short course in the engineering problems involved in getting man into space.

The booklet, "Challenge of Space Exploration," contains schematics of space ships, engineering tables for a hypothetical round trip to Mars, a glossary of space terms, a description of tracking and control systems, and a rundown of biological problems of man in space.

Booklet (one to a person) is free. Write National Aeronautics & Space Agency, Washington, DC.

German Air Force expands...

West Germany's aircraft makers have finally been given the go-ahead by the country's Defense Ministry to build $300 million worth of military aircraft under license from foreign firms.

Heinkel, Dornier, Messerschmidt and Siebel will build fuselages for American-designed Lockheed F-104's and Italian-designed Fiat G-91's.

Powerplants will be made by Bayrische Motorenwerke (BMW), which will manufacture GE J-79's, and by Kloeckner-Humboldt-Deutz, which will make British Bristol Orpheus engines under license.

West Germany's Defense Ministry now plans to buy 200 all-weather, multipurpose Mach 2 F-104's from German suppliers, supplementing 100 such planes built by U S's Lockheed. First German-made F-104 will come off Messerschmidt's assembly line in autumn of 1961. First Fiat G-91's will be produced by Dornier in about 20 months.

German aircraft industry has resolved to do the job within its present capacity, on grounds that creation of additional capacity to fulfill the contracts would cause unemployment in the industry when the contracts phase out in 1964-1965.

Thus only $10 million will be invested for additional equipment, $8 million of it by the makers of aircraft engines.

New life for old lathes with:

Cushman air operated

CHUCKING EQUIPMENT

Cushman, the leading manufacturer of air operated chucking equipment, offers a complete line of air operated chucks, cylinders, and accessory equipment which enable your quality-built older lathes to continue in competitive productivity.

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Sold through industrial distributors

MACHINE TOOLS...

Navy places big orders...

Business is looking up in machine tools. The Navy, for one thing, has been placing sizable orders to use up its authorizations for fiscal 1959.

About $3 million of orders for milling machines is reported to be part of Navy's recent orders. Navy's allotment for modernization and replacement in fiscal 1959 totaled $21 million.

Auto stamping plants planned...

Feeling is growing that the automobile industry will break loose with substantial orders for both cutting type and forming type machine tools later in the year.

There appears to be a good chance that Fisher Body Division of General Motors will build and equip at least one new stamping plant, and perhaps two.

Ford, it is believed, may decide to add to its stamping capacity. Favorable action on one or more of these projects would result in the largest orders for presses since the Ford and General Motors programs several years ago.

Detroit is thinking in terms of production of 8 million passenger cars and trucks in the calendar year 1960. If retail demand should support this forecast—and retail sales are doing far better this year than expected—automobile companies are likely to be hard pressed to get out that many units at a satisfactory cost. They will be compelled to bring into operation their most out-dated, least-efficient facilities.

When demand actually gets up to such a high level or comes threateningly near it, Detroit is almost sure to order machine tools once again at a good rate. Traditionally, automobile people are either in a spending mood or almost stop buying altogether. Lately they have been in a sackcloth-and-ashes mood, confining their purchases to bare essentials.

They have tooled for new small cars in the most economical way possible, principally by rebuilding.

Signs are multiplying, however, that they are feeling much better than in a long time. Though any action may be months off, don't be too surprised if news should burst one day of a big machine tool buying program in Detroit.

Norton diversifies...

Trend in the machine tool industry still is to diversify, either by adding other products than machine tools or by expanding tool lines.

Latest example of this trend is the entry of the Norton Co into manufacture of centerless grinders. After several years of research, Norton has announced a line of straddle bearing centerless grinders. The straddle bearings on the grinding and regulating wheel spindles provide support on both sides of the wheel to prevent deflection normally encountered when an extra wide wheel is mounted on the end of an unsupported spindle. Detailed description of the new Norton line is on p000.

Announcement of the new Norton centerless grinder followed closely on news of the acquisition by Norton of Gould & Eberhardt's line of shapers and gear hobbing machines.

Prices going up...

Several machine tool builders have announced increases of 5 to 10% in the list prices of their machines. At the same time, some manufacturers of cutting tools ahve notified customers of price advances effecti veJuly 15.

Depreciation as a buying incentive...

Denmark is providing loan guarantees or is granting outright loans of up to 40% of machinery cost to machinery buyers, according to Ralph E Cross, executive vice president Cross Co. It permits maximum writeoff each year of 30% of the value of capital goods after deduction of previous depreciations. Moreover, up to 15% of profits are tax-free if deposited in funds earmarked for future investment purposes.

Obsolescence could be reduced in this country, Mr Cross contends, if our tax laws were like those of Denmark and of other nations which grant an incentive for capital investment.

Distributors stage shows...

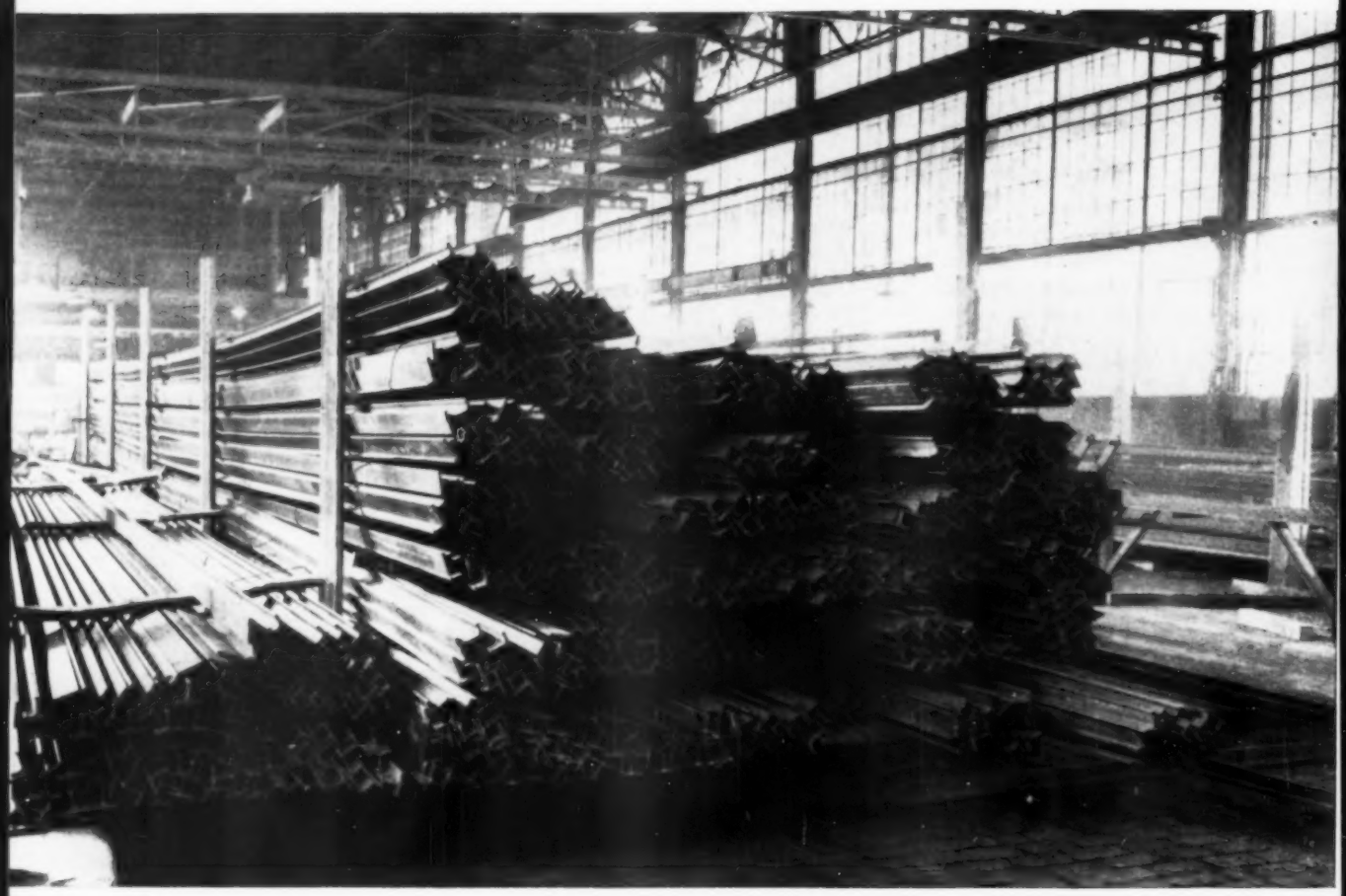
Machine tool distributors recently have staged important shows of their own.

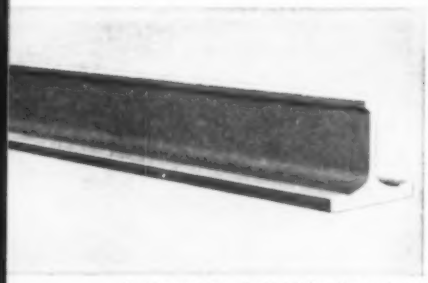
Harrington-Wilson-Daum Corp, Mt Vernon, N Y, attracted 1400 visitors from 600 plants in Connecticut, eastern New York and northern New Jersey to its 35th anniversary celebration and show. Two machines, each with GE two-position numerical control, were on display.

Robert E Morris Co, Farmington, Conn, put on a show at which three Morris-Omega cold heading machines for manufacture of precision miniature parts were demonstrated for the first time in this country. A number of domestic-built machines also were on exhibition.

BF

STEEL SHAPED TO CUT COSTS AND IMPROVE PRODUCTS





A one-piece rail rolled for the runway of Cleveland Tramrail Systems. This track has flat raised treads designed to minimize peening. No machining is required on this USS Special Section.

USS

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Export Company

United States Steel

Tramrail—non-peening, no machining made from USS Special Sections

This supply of rails for Cleveland Tramrail Systems represents a cost saving running into many thousands of dollars. They are USS Special Sections rolled to exact size and cut to proper length. If the rails had to be machined from bars of high-carbon or alloy steel, the cost would be prohibitive and scrap losses tremendous.

The steel is furnished in a high carbon grade which serves to minimize track wear caused by wheel peening on the track tread. The manufacturer says that in 30 years no other overhead track has been offered that surpasses this one for durability.

It's seldom that better products can be produced at substantially lower costs but that's what happens when you use rolled USS Special Sections. Rolled to the predominating cross section needed, it is a custom-tailored part, designed and rolled so that there is little or no finishing required to meet final specifications.

Why not find out what USS Special Sections can do for you? This is one *sure* way you can help to keep costs down and get faster production at the same time.

Write for our new book, USS Special Sections. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

TRENDS

MATERIALS...

That dark horse...

It's pretty clear that aluminum will play a major role in the small cars being readied by American builders. From engines to ornaments, aluminum obviously is entering a new era which may lead to wider use in big cars, trucks, military vehicles, even ships. With the facilities available for the volume of aluminum to be used in automobile engines, whole new marketing philosophies might develop. As one visualizes this potential unfolding, the Volkswagen engine and another metal, magnesium, cause some serious speculation.

Price seems to be the significant basis for decision between aluminum and magnesium as material for the small-car engine. What would happen if the price of magnesium were lowered 20 to 30%, to make it competitive with aluminum? It might be possible to do just that—if a major auto builder guaranteed a substantial order at the lower price. In fact, it might even be *necessary* to find a price that opens doors—as another major source of magnesium offers its output to the market.

A price reduction that brought in a large automotive order for magnesium could revitalize the entire selling effort. Recently developed magnesium alloys, including the rare-earth compositions, plus new plating and finishing techniques, would be reviewed in the light of the new economy. Agricultural machinery, roadbuilding equipment, appliances, hardware, and many other products would have potential uses for the metal.

Today, magnesium's best customer is the aluminum industry. A sizable quantity of mag goes into the aluminum-magnesium alloys. Tomorrow the auto industry may be the best customer for both metals, although use of the alloys is growing too. Only time will tell what measures the aluminum industry might take to compete with a less expensive magnesium—if it is offered.

Forgeable tungsten...

Sintered tungsten and tungsten-alloy billets, plus preformed shapes, which are readily forgeable, are offered by Firth Sterling Inc, Pittsburgh. Heretofore virtually impossible to fabricate, pure tungsten and tungsten alloys such as tungsten-molybdenum and tungsten-tantalum are now available in a condition suitable for forging at 3400 to 3500 F. Hollow, conical and cylindrical shapes up to 8 in. dia and 4 in. long, as well as 4½-in.-dia billets up to 12 in. long can be provided.

Ingots of pure tungsten 10 in. in dia by 20 in. long and weighing 1100 lb soon will be available. By vacuum sintering, tungsten metal of 99.9% purity with densities exceeding 90% of theoretrial shows remarkable machinability characrial shows remarkable machineability characteristics at room temperature, after forging. Firth Sterling is producing an alloy of 50% tungsten and 50% molybdenum (one-half the weight of tungsten) with a melting point close to 5300 F in preformed shapes.

In addition to its weight, density, and high-temperature properties, tungsten's modulus of elasticity (stiffness) is about twice that of steel. Availability of preformed and forgeable shapes may make tungsten's rigidity more useful in machine-tools and fixtures.

High-temperature insulation...

Composed of rubber and asbestos, a new insulation developed for the Navy by Astrodyne, Inc, will extend the capabilities of solid-propellant rocket engines for long-duration, high-thrust applications. In tests of solid propellants having flame temperatures exceeding 5500 F, the new insulation held the exterior of the rocket-motor case to 200 F for 3½ min—at least 3 times best previous record.

Continuously cast steel...

Concast Co, Ltd, Zurich, Switzerland, has developed a process for horizontal continuous casting of steel. Two horizontal Concast/Tessman machines, for casting steel, have been constructed. Tests look promising. A third experimental machine will soon be put into operation in Europe. The process has been proved commercially practical for nonferrous metal billets.

For nonferrous casting, Concast is constructing two wide-slab machines—one for Yawata Iron and Steel Co, Ltd (Tokyo) and one for the Ste des Fonderies de Pont-a-Mousson (France). These slabs will be up to 50 in. wide and 4 to 8 in. thick.

Doubled strip capacity...

By opening a new stainless-steel strip plant at Coshocton, Ohio, with a capacity of 20,000 tons per yr, Universal-Cyclops Steel Corp has more than doubled its strip-producing capacity. The new plant, which by next year will represent an investment of $13 million, permits increased emphasis at the Bridgeville, Pa, plant on all types of specialty steel strip.

A COMPLETELY NEW SERIES!

Lodge & Shipley PRESS BRAKES

WILL *YOUR* NEW BRAKE HAVE ALL THESE FEATURES AT LODGE & SHIPLEY'S LOW *STANDARD* PRICE?

NEW . . . Pitman Assembly redesigned for long life with little maintenance

EXCLUSIVE . . . Combination Air Clutch and Mechanical Brake

NEW . . . Wedge Ram Pressure Release, improved exclusive design

NEW . . . Quad-lateral Ram Slide Bearing, full-length, full-time

NEW . . . Ready-Pivot Ram Adjustment for out-of-parallel operations

NEW . . . Dovetail, Double Rocker Bed-Mounting on solid steel housing

NEW . . . "Long Operation" standard controls for versatile operation

PROVED . . . One-piece, heat-treated, machined and ground Eccentric Shafts

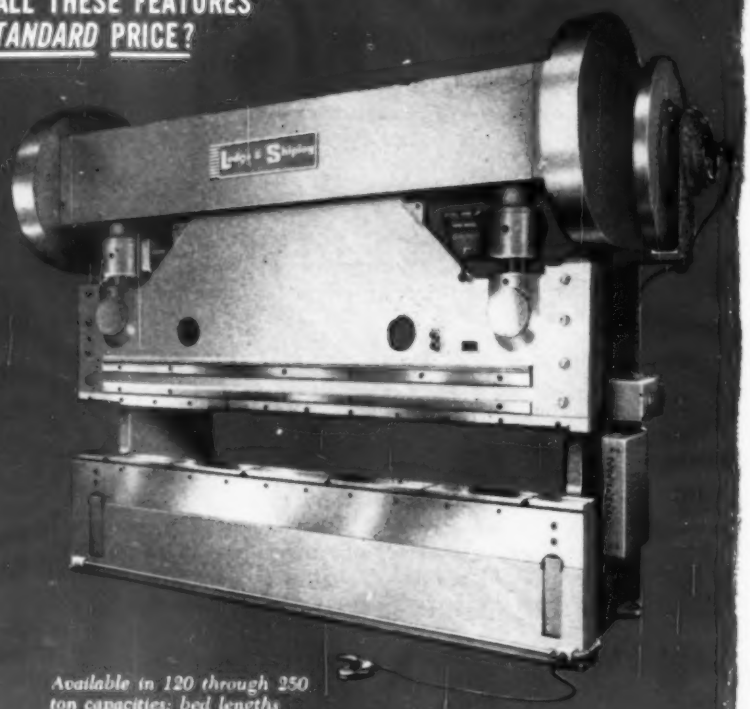
NEW . . . Micro-Fog, oil bath and grease Lubrication System

PROVED . . . Two full bearings on each eccentric shaft

NEW . . . Sectional die clamps on ram nose open automatically

NEW . . . Stroke Position Indicator shows top and bottom dead center

NEW . . . optional Two-Speed Transmission can be field-installed



Available in 120 through 250 ton capacities; bed lengths from 8 to 14 feet. Shown is Model Series 150A10 capacity 1/4" x 10' with above-the-floor bed.

New and completely redesigned, Lodge & Shipley Power Press Brakes offer feature after feature important to accurate, low-cost operation. Virtually every one of these advantages are included in the low base price . . . extras on the machine but *not* on the invoice and many of the models now have an above-the-floor bed!

Space limits us to a bare listing of important new features. Request your copy of the New Condensed Press Brake Catalog today. The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.

SEE OUR CATALOG IN SWEET'S

More than ever before, your LODGE-ical choice . . . **Lodge & Shipley**

WHAT'S AHEAD... in Metalworking

TRENDS

Operations are at near-boom levels...

Most metalworking companies have been operating at near-boom levels for the last couple of months, but they are reluctant to make any concrete predictions for the future until the steel situation is settled once and for all.

Take for example the National Screw Machine Products Association, which last year forecast that its business for the first six months of 1959 would hover around 185 on its index (1946-1949=100). Now, NSMPA, admits its forecast was too pessimistic—business is at the 200 mark on the index, very close to record 1956.

Screw machine products backlogs are still building up, are now at 10 weeks, compared with a low mark of 6 weeks in April-May 1958. But, says an industry spokesman, "We will have to wait out the steel strike to see how much water there is in this backlog."

April sales in the tool and die industry jumped 10% over March, continuing a steady climb that began last December. Latest figures show that backlogs are running around 20% ahead of comparable 1958, and May-June sales are up.

Gray iron foundries are now operating at levels about 30% higher than last year. This adds up to a 13.5-million-ton year, compared with 10.4 million tons in 1958, making 1959 the best operating year since 1946. Orders are particularly strong from the automotive, construction, general machinery and farm equipment industries.

Steel foundry bookings have moved up from 27.6% of maximum demand a year ago to 65%.

Improvement in orders is widespread—from the railway equipment, farm equipment, roadbuilding, electrical machinery, valves and fittings and rolling mill equipment industries.

Metalworking job shops, almost the last metalworking segment to come out of the recession, are now doing very well. Workweek in most shops has been stretched to six days, and orders continue to pour in. One firm estimates its current production at exactly double that of last year, expects the stepped-up pace to hold through 1959.

Appliances continue to lead the boom in consumer goods. One firm, for example, says sales in the last six weeks have been even better than they were earlier this year. June figures are expected to show one of the best sales months in the last five or six years.

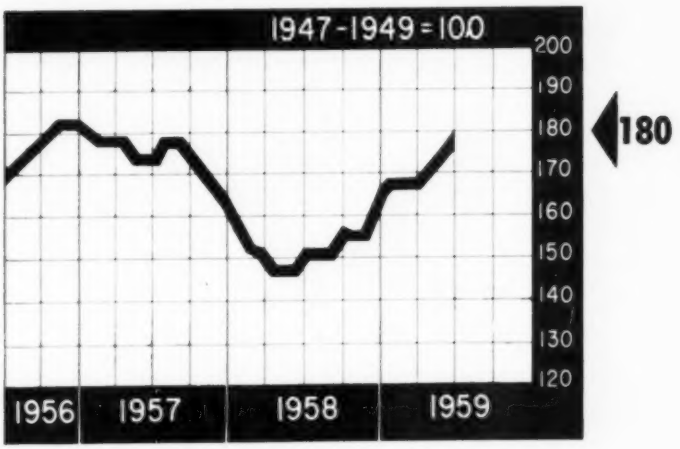
But the profit squeeze is on in the appliance industry—mainly because appliance makers are long overdue in hiking their prices. You can look for a price increase with new fall models.

Outlook is rosy for makers of fork lift trucks and other materials handling machines. At least one manufacturer reports backlogs are up somewhere between 60 and 70% over last year.

Metal stamping orders have increased nearly 50% in most shops over comparable 1958 levels, but here again profits are the thorn in the rose.

Backlogs are running at nearly two-month levels and steel inventories are high enough that operations can continue for about 60 days.

Farm equipment manufacturing continues at high levels, and the same is true of construction equipment manufacturing, which is picking up after showing a few soft spots for several weeks.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE Estimated	MAY Preliminary	APR Revised	MAY Year Ago
Total Index	**180**	**178**	**173**	**148**
Machinery	148	145	123	
Electrical Machinery	207	198	167	
Autos	132	133	90	
Other Transportation	363	348	340	
Other Metalworking	154	149	126	

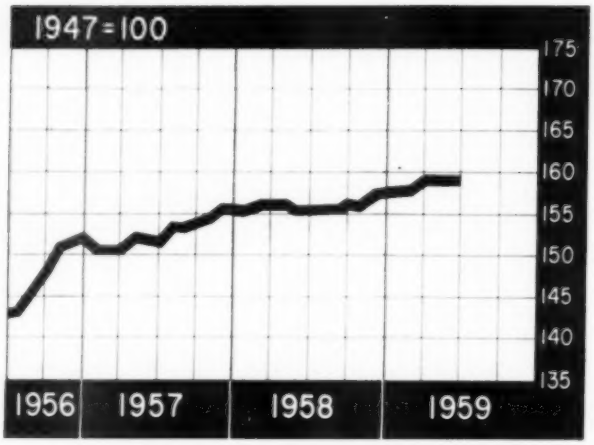
TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JUNE Estimated	MAY Preliminary	APR Revised	MAY Year Ago
Total Index	**158.6**	**158.6**	**158.5**	**155.8**
Metalworking Machinery	... 184.9	184.2		181.1
Other Machinery exc. Electrical	. 169.6	169.6		165.8
Electrical Machinery	.... 159.7	159.3		158.5
Fabricated Metal Products	..... 148.8	148.8		146.4

158.6



Will inventories be a problem?

Inventory accumulation in recent months has been a substantial factor in sparking industrial output. Businessmen added to their stocks at an annual rate well in excess of $8 billion during the second quarter of this year.

Last year, on the other hand, businessmen were drawing on their inventories, thus holding down output and creating an additional drag on the economy. Even though the inventory pickup in the early months of this year has been the most rapid we've seen in some years, there isn't any indication that businessmen will do an about face on inventory policy, thereby sending the economy on another downward swing.

In contrast to what was happening last year, manufacturers' sales have been rising steadily over the past few months. The boost in sales has created a need for additional stocks for servicing customers.

Automobile inventories, for example, have risen sharply during the past few months, but auto dealers are now enjoying the best sales they've had since 1955. As long as sales continue to rise in step with inventories, manufacturers and retailers will feel no need to cut down stocks.

New orders, too, have been rising. New orders received by manufacturers are, of course, running far ahead of last year's recession levels. But they are edging past levels set in comparable months in 1956 and 1957, too. These new orders will continue to provide a drain on the output of manufacturers.

Thus they provide a safeguard against the kind of inventory liquidation we saw last year.

Unless sales fall off there is likely to be a further buildup of inventories (except, of course, in steel and some other areas where stocks are heavy), because current ratios of inventories to sales are not yet up to pre-recession levels. Once those customary inventory-sales relationships are reached, businessmen will stop adding to their stocks.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	158.7	158.5	132.7
Steel ingot production (thousand tons)	2,405	2,486	1,376
Electric power output (million Kilowatt hours)	13,749	13,331	11,757
Production of automobiles and trucks	167,615	167,438	118,320
Engineering construction awards (Eng. News-Record, millions)	$474.1	$491.9	$466.3

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	301	337	211
Vacuum cleaners sales (thousands of units)	317	347	247
Washers sales (thousands of units)	278	330	219
Household electric ranges sales (thousands of units)	80	102	58
Radio production (thousands of units)	1,040	1,348	652
Television production (thousands of units)	389	494	303
Gear sales index (1947-49=100)	N.A.	234.3	153.2
Foundry equipment new orders index (shipments, 1947-49=100)	154.2	166.6	88.7

* Seasonally adjusted
N. A. Not Available

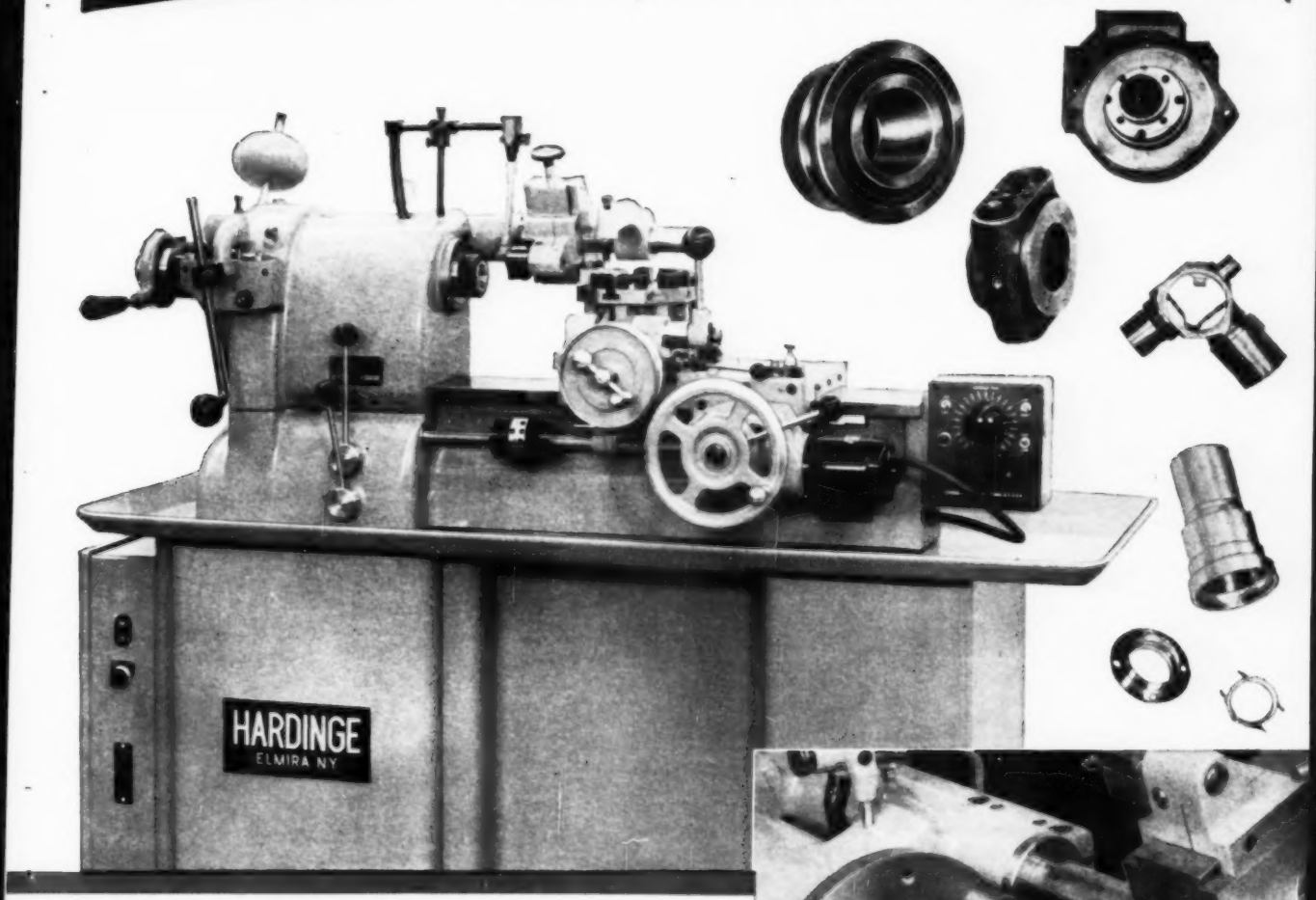
CIRCLE 237 READER SERVICE CARD

HARDINGE
ELMIRA, N.Y.

PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"



Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

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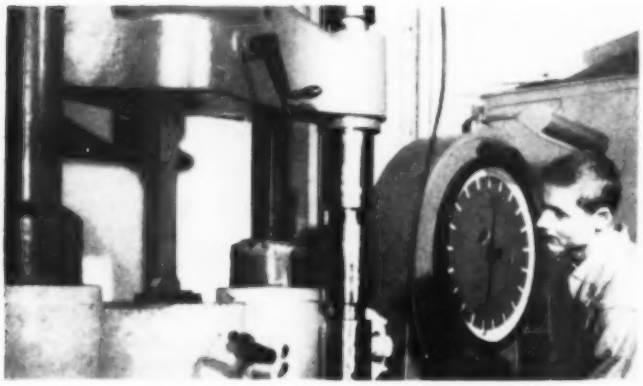
Stretched to the Breaking Point!
Armco ZINCGRIP Doesn't Flake or Peel

Tension tests prove the special Armco hot-dip zinc coating won't flake or peel even when the base metal is pulled apart. The coating on ZINCGRIP™ adheres tightly right up to the broken edge.



Tensile test specimens of Armco ZINCGRIP Steel, with grid lines to show extent of stretching, are pulled to fracture. Elongation of about 70%, in the area of the fracture, caused no flaking or peeling of the special hot-dip zinc coating.

These tensile test specimens dramatically demonstrate how Armco ZINCGRIP Steel can be deformed without damaging its rust-resisting zinc coating. Nowhere on the specimens, cross-hatched to show amount of stretching, is there any evidence of flaking or peeling of the zinc coating. Even at the edge of the fracture, the base metal is still protected by the ductile, adherent coating.

Draws, Forms, Bends

Results of tensile tests aren't the only evidence of the unusual ductility of the protective coating on Armco ZINCGRIP. For almost a quarter-century this has been demonstrated in plants throughout the country where it has been drawn, formed, pierced, bent, extruded and stamped without flaking or peeling the zinc coating.

Get complete information on the properties, and fabrication of Armco ZINCGRIP Steel. Write Armco Steel Corporation 2779 Curtis Street, Middletown, Ohio.

ARMCO STEEL

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American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

How Ready Are You?

The metalworking industry has staged an impressive recovery from its recession low in 1958.

Within little more than a year, production has come back up on the AMERICAN MACHINIST Index from 146 to 180 (1947-1949=100). It now is hovering around the all-time peak.

Even more intriguing than the rapid upsurge in operations the past year is the promising prospect ahead.

Take the automobile industry...

It is talking confidently of a seven-to-eight-million-unit year in 1960. And that would be not far below 1955's record year. Strong retail car demand this year lends sound support to Detroit's hopes.

You can go on from there to other important segments of the metalworking industry with like observations—appliances, farm equipment, electronics, heavy electrical machinery, aircraft and missiles, to name only a few. In each one of them the outlook is on the plus side.

Best of all, capital goods again are moving up. The McGraw-Hill Index of Machinery Orders confirms a healthy recovery in bookings. That is a forerunner of increasing production rates as the months go by.

You can make out a good case...

for the proposition that 1960 looks to be the biggest metalworking year ever. The physical volume of goods produced may well surpass that in 1957, when it soared to a new record.

The long-term prospects, if anything, are more pulse-quickening than the short term. All the growth charts from the past, projected even on a conservative basis into the future, point to substantial expansion in demand and production during the next decade. The nation's population increase by itself will require a sizable expansion in goods and services.

How prepared are you to make the most out of the favorable situation confronting you? What kind of shape is your plant in? Do you have the capacity to meet expanded demands by customers? Do you have the right kind of capacity? Do you have low-cost capacity?

Keep in mind the situation in the automotive industry. Various vague estimates of the industry's facilities have been made, on the general assumption that, if pushed, car makers can turn out nine to ten million units a year.

The truth is, though, that the industry's effective capacity probably is far below those figures. In fact, the statement has been made that the industry would have a hard time producing eight million units without bringing into operation high-cost, obsolete equipment.

Are you in a better spot...

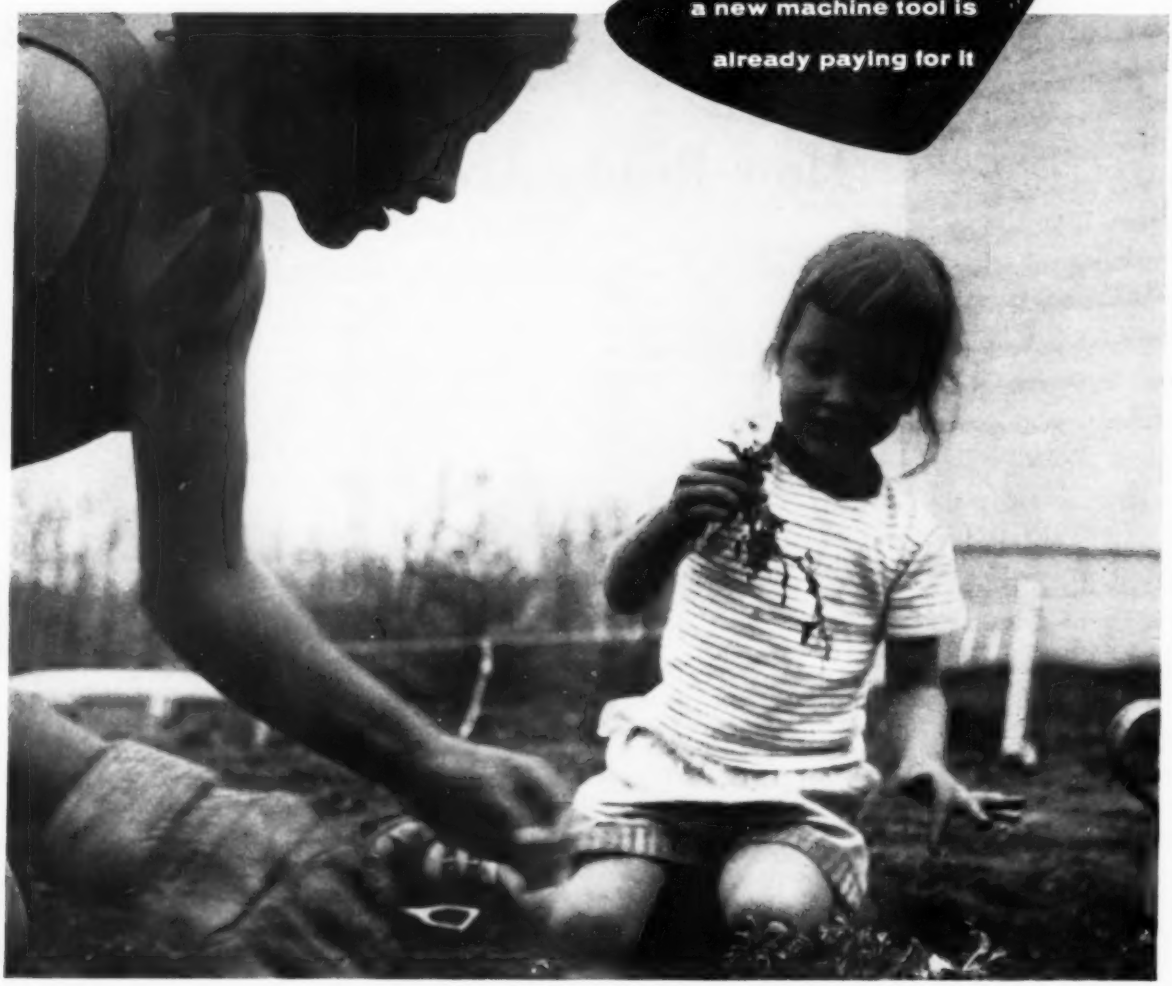
than the automotive people? Remember that you cannot afford to wait until top demand is upon you before taking action to put your plant in the best possible condition to handle maximum business at a good profit.

In anticipation of higher volume the next few years, now is an appropriate time to examine your production equipment, your materials handling operations and your plant facilities in general. Make sure that they are modern. Above everything else, see that higher hourly labor rates the next few years will not eat up the profits that you might expect from an increased volume of business.

Burnham Finney EDITOR

JONES & LAMSON MACHINE COMPANY

the man who needs a new machine tool is already paying for it



Spring planting...1949

Just ten short years ago, but a lot of changes have taken place.

Except for Mother, who is every bit as attractive, nothing has remained the same. The garden is now long-established and flourishing, and Daughter is entering college in the fall.

In Dad's shop, things are quite different, too. Labor rates, prices of raw materials and overhead have kept climbing constantly.

Those once-new machines are still running O.K., and seem to have plenty of usefulness left in them. The big hitch, though, is that their performance standards were based on the costs of *ten years ago*. With today's increased costs, the *profitability* of these machines is in serious doubt.

The cost analyses Dad is now completing show very clearly that successful production under *today's* conditions requires *modern* equipment. He used J & L's new "Avoidable Costs" Replacement Formula. It's simple, clear cut and realistic, and avoids the fallacies found in other replacement formulas.

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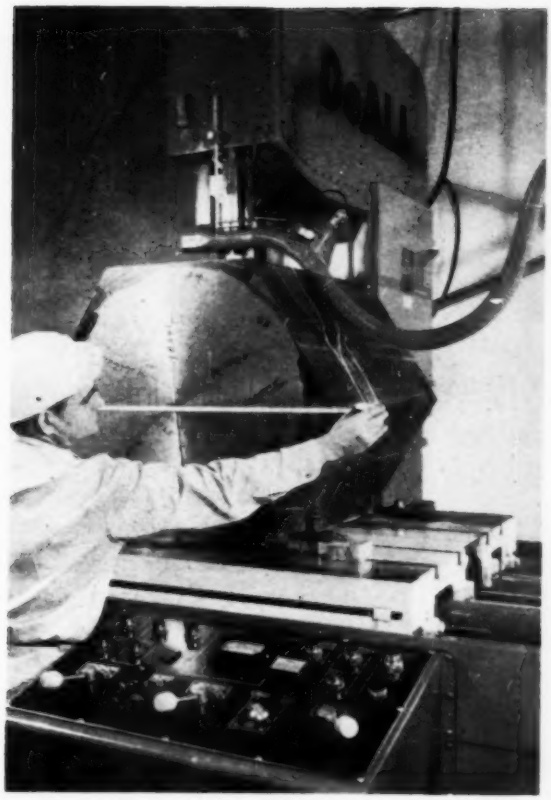
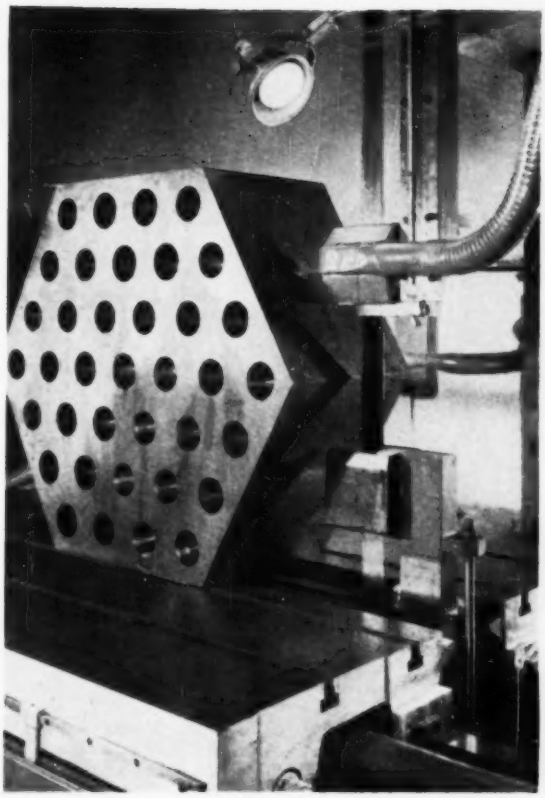


Beryllium billet is machined to hexagonal shape, then sliced into thirds on bandsaw. Each cut took about 12 hr. Billet at this point has saved 180 hr of furnace time



Holes are trepanned, then billet sections are sliced again to produce 13 hex plates. Total investment in original billet was $150,000

Billet slicing marks a giant step in beryllium fabricating

By Clark R Bennett, manager, Cleveland Fabricating Div, Brush Beryllium Co, Cleveland

One run through a sintering furnace produces 13 plates of beryllium to save 20 hours of furnace time. This significant improvement in method is possible because a single large billet of the expensive metal can be bandsawed apart economically to make a number of parts that would have required, not long ago, separate furnace operations.

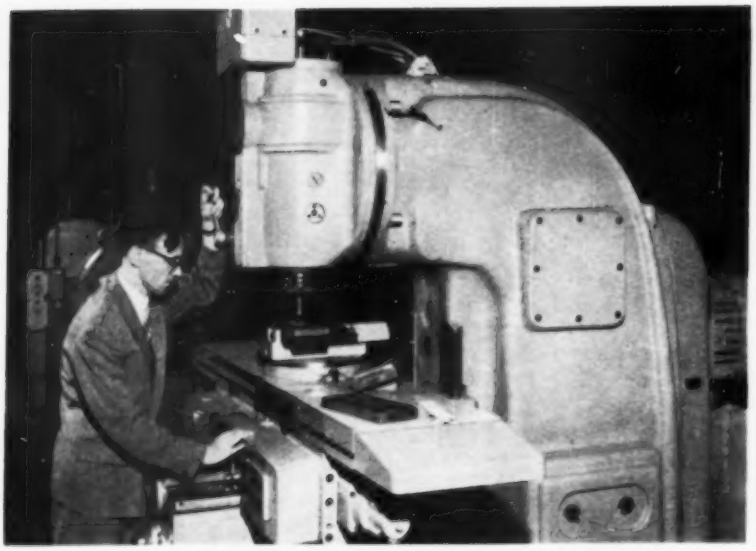
Bandsawing also saves 1020 lb of metal—worth $51,000—by eliminating some of the cleanup machining and dish-effect allowances normally required. The beryllium is originally produced as a vacuum-cast ingot, which is powdered, then vacuum-pressed to size and shape in a sintering furnace. As a single large ingot, the metal has less graphite skin and less center shrinkage caused by cooling pressure.

The parts are QMV beryllium plates for a nuclear reactor, and are 30 in across hex faces and from 1 to 2 in. thick. They are sliced apart from a cylindrical ingot 36 in. in dia and 36 in. long—which is machined on the sides to produce the hex shape. Slicing is done at a new DoAll Band Mill, which has greater capacity than any of the other five bandsaws in the shop. The machine is equipped for extra work height up to 36 in., and has a hydraulically powered lower guide that can be raised through the table to support the sawblade when the work does not rest flush on the table.

Savings are also made in machining operations. Each plate requires several openings, normally produced by drilling. But with the bandsaw it is possible to cut the ingot into three pieces and to trepan the openings in each section.

Then the plates are sawed apart with a 2-in. 2-pitch HSS Demon saw operating at 130-140 sfpm. Coolant is applied, and the usual intake shrouds applied to upper and lower guides to exhaust chips and dust. Cuts of 780 sq in. are made in 14 hours —a rate better than 0.9 sq ipm, which is fast according to our experience.

The billet represents a milestone in beryllium technology—it cost $200,000 and weighed 2575 lb before cutting—the largest powder-metal part to date as far as we know. Further advances and cost reductions with beryllium should push it more into the structural-material area, because it is nearly as light as magnesium, has strength comparable to steel and greater rigidity than steel, a melting point twice that of aluminum, and thermal conductivity higher than most structural alloys.



Numerically controlled 3-D miller routs out the word "Peace!" . . .

a subtle propaganda touch at the Soviet Exhibition being held this month at New York's Coliseum. Operating the miller is Alexander Lebedev, an electronic engineer with Stankoimport, Russia's state-operated export organization. Russians, incidentally, see great possibilities for numerical control, are curious as to how far the US has progressed with it

Russian metalworking comes

Eight machine tools are today sharing the spotlight with Russia's greatest scientific accomplishments in the huge center hall of the Soviet Exhibition in New York. The machine tools' place of honor alongside models of Sputniks I and II, Russia's newest jet transport and a mockup of a man-carrying rocket is indicative of the high importance that the Russians attach to the basic tools of metalworking in the USSR's all-out drive to attain world industrial supremacy.

The eight machines, all under power, are featured in a 40-day-long (June 30-August 10) display of the Soviet Union's outstanding achievements in fields ranging from steelmaking and medicine to theatre, ballet and fine arts.

The machines: a bearing-ball inspector, a bearing-roller inspector ,an electrical discharge machine ,an automatic bar turner, an ultrasonic cutter, an automatic gear generator, and two tape-controlled millers.

Numerical control, incidentally, is a red-hot metalworking topic in Russia, just as it is here. Indicating the two millers on display, Russian engineers manning the exhibit asked, "Do you have anything like this in the United States?" and were a bit chagrined to learn that numerical controls are out of the experimental stage and commercially available here.

The Russians are especially proud of a three-dimensional contour miller that is routing out the word "Peace!" in three-inch-high letters from steel blocks —a neat propaganda touch that has been used in other Soviet exhibits in India and elsewhere.

This numerically controlled machine can do die-sinking and other 3-D jobs, is computer-programmed, develops 15 hp and has cutter speeds up to 3000 rpm.

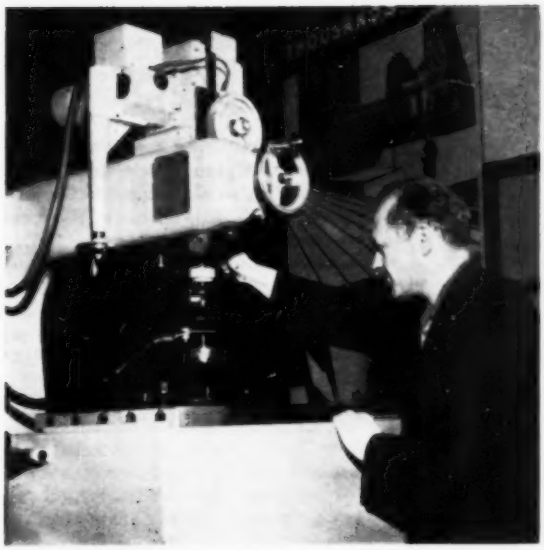
Also operating at the Exhibition and producing, as one Russian put it, "smoke less than that from two cigarettes," is an electrical-discharge machine as advanced or possibly more advanced than any in this country. The machine is capable of sinking a 5 x 5 in. cavity into the work. Electrode is graphite for roughing cuts, brass for finishing cuts. Both will wear an average of 2 to 3% during each cut. Machine draws 28 kw, will erode up to 20 cu. in. per hour. Power is supplied by an impulse generator—the same method used in the more recently developed Japax (Japanese) machine.

An automatic bevel-gear generator operating at the Exhibition takes 2½ minutes to turn out an eight-tooth bevel pinion in chrome steel. Tooth depth is about 10 mm. The 7-hp machine handles gears up to 500-mm diameter. Blanks are fed in from a chain loader, are ejected into a pan when finished.

Automatic bar-turning lathe on exhibit works from a templet which controls the geometry of a piece while a perforated paper-tape program controls the sequence of operation. Machine has an automatic size control (in-process gage) that advances a worn tool so that it produces parts to the original specifications, which are checked by a built-in measuring device. Loading and unloading are automatic, from the rear of the machine.

Also operating at the Exhibition is a bench-sized ultrasonic cutting machine that is actually smaller than the electronic cabinet that controls it. The machine is designed to extremely detailed and intricate work on hard-but-nonconductive materials, such as are used in transistors.

The two inspection machines on display—one for bearing balls and one for bearing rollers—are equipped with size and roundness classifiers. One is capable of segregating at least 20 sizes of bearings, and it inspects bearing taper of parts to 35 microns. The second classifier feeds parts from a single dial-feed



Electrical discharge machine . . .

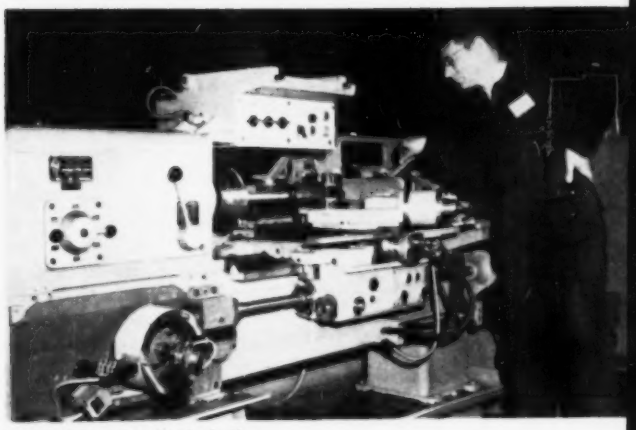
is operated at the Exhibition by Valery Solovov, a machine tool designer with the Soviet Bureau of Design

to New York

drum into a set of two parallel tracks for size inspection.

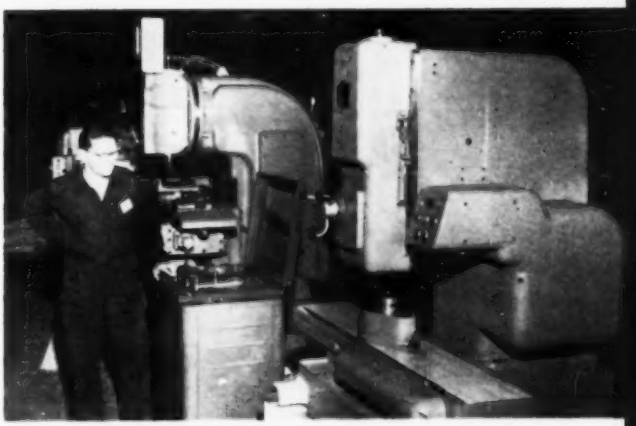
The Russians have missed no chance to extoll the accomplishments of the USSR at the Exhibition. Backing up the machine tool and other displays in the center hall are 15-foot-high posters showing the USSR's achievements and goals. For instance:

- By 1965 the USSR will be producing 1550 types and sizes of machine tools. This compares with 39 types and sizes in 1913 (last peacetime year of the Czarist regime) and 970 in 1958.
- In 1913 Russia had about 1500 metal-cutting lathes in all. ast year there were 138,000 (whether this means Russia had this many in use or whether it had by then produced that many, some for export, the poster doesn't say). By 1965 the Russians expect to have (or have produced) 190,000 to 200,000 lathes.
- Last year the USSR had 24,600 forging machines and presses. By 1965, it will have 36,200.
- Taking the year 1913 as an index of 1, total production of Russia's machinery building and metalworking industries reached an index of 240 in 1958. By 1965 the index figure will be 480.
- In 1958 the USSR put out more than 1600 new types of machines, mechanisms and other equipment. Its factories introduced close to 150 automatic and semi-automatic lines.
- In 1958 Russia's vocational students produced 5500 metal-cutting lathes, repaired 20,716 railway locomotives and cars, smelted 1092 tons of steel.
- In 1958 alone, Russia trained 93,000 engineers.
- About 7.5-million specialists (with higher or special secondary school training) were engaged in the Soviet national economy in 1958—39 times more than in 1913. In 1959-1965, Russia claims that it will have trained 2.3-million specialists in its institutions of higher learning.

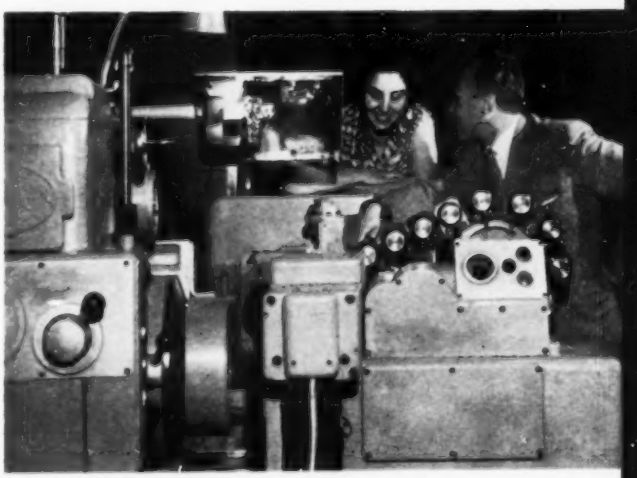


Templet-controlled lathe . . .

gets a few last-minute adjustments before the Exhibition opens by Valentine Levshunov, Stankoimport engineer in charge of machine-tool exhibits

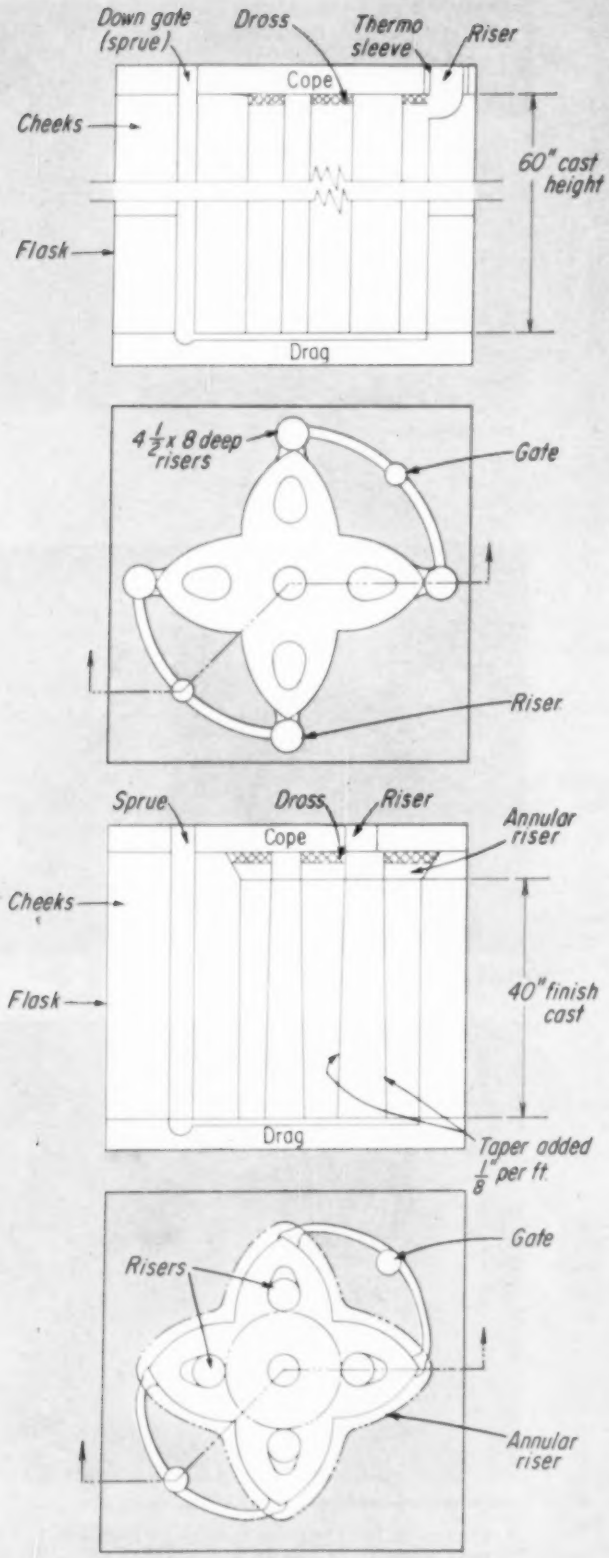


Numerically-controlled 2-D miller cuts a cam



Automatic bevel-gear generator . . .

is explained by Juli Evstigneev, research engineer with ENIMS (Russia's machine tool experimental organization) to Eugenia Bakutina, official interpreter for the Exhibition's machine-tool section



REDESIGNED MOLD CASTS CORE SECTIONS
Original full-length mold (top) produced excess dross and porousity in the work. New mold (bottom) reduces these effects

Special

Unusual setups do the difficult casting, welding, and machining on fuel cores for the solid-fueled "Minuteman" missile. The cores are produced by Kaiser Aircraft & Electronics Div, Kaiser Industries, Richmond, Calif, as processing units. They are withdrawn from the missiles during fueling operations, and are therefore not flying components; but they are vital to missile performance.

A fuel core is a big aluminum casting that is inserted in the fuel chamber. As the fuel solidifies around the core, it leaves a centered, contoured cavity into which another fuel with a different burning rate can be poured after the core is withdrawn. Sometimes two such cores are used, the second one the same length but smaller in section, to allow three different fuels in the missile.

When the missile is fired, fuel burns from the center outward, and the shape of the interfaces between different fuels affects burning rate.

Reasons for accuracy

The cores must be withdrawn without sticking to the plastic mass of fuel,

All castings are X-rayed . . .
to check density and to locate best areas before cutoff. Welded-together sections of 356 aluminum must stand 20-ton pull force as they are withdrawn from fuel

setups produce missile fuel cores

so good surface finish—at least 125 mu in.—is required on the castings. Conventional casting methods for the big cores—10 ft long, 3 ft across, and tapered from one end—produce excessive dross, risers that require constant filling, and low cast density—only 2.62 gm/cc because of gas porosity.

Reducing the size of the castings to no more than 40 in. long, plus redesigning the molds, eliminates dross and increases density to 2.68 gm/cc. Therefore each core is made up of three body castings, plus a 6061-T4 aluminum head, a stainless-steel insert, a 6061-T6 aluminum guide tube, and a 6061-T4 aluminum adapter. This improves casting density throughout, and reduces surface porosity, too.

Castings are X-rayed before any machining operations to determine how much should be cut off the end to insure uniform density throughout the usable remainder. Density is checked within predetermined limits to insure meeting welding requirements. Cast surfaces and wall thicknesses are checked. Then sections are heat treated and aged to T-6 condition before machining.

Initial machining operations are more or less conventional—facing the ends, counterboring, establishing an "average" centerline that will produce maximum wall thickness, then boring on this centerline. Reference points for welding are established, the weld chamfers are ground, and the machined faces are deburred. The upper body must be faced to a length determined by the lengths of the other sections after their porous ends have been cut off, plus tolerance allowances. The insert, tube guide, and adapter are machined; then the components are ready for welding.

Welding procedure

The end core is first welded to the tube guide with an Airco gas-shielded arc-welding gun. Then this subassembly is welded to the head, upper body, and lower body, aligning the components with match marks and reference points. The great mass of metal conducts heat away rapidly, so a 500-amp welder is required. About 280 amps of AC are employed with an argon-shielded tungsten electrode. This technique eliminates weld cracking or locked-up stresses because of heat concentration. The tungsten arc concentrates 10,000 to 15,000 amp/sq in. of electrode. Weld filler metal is 43-S aluminum wire.

Profile machining

Contour machining is done with an Arrow profiler with a True-Trace hydraulic attachment. The tracer travels with the spindle in engagement with the templet, so an excessively large templet with the entire contour is not required. The templet shape covers only ¼ of the peripheral contour. The assembled symmetrical core is indexed as the operation proceeds.

Core taper is produced directly from the tool surfaces, which eliminates shimming the work 0.006 in./ft. After rough and finish contouring, the core is completed in a radial drill where the insert and adapter fittings are dowelled into place—after they are aligned, and the core is drilled and reamed in eight places. This completes the unique fuel core.

Large core is profiled . . .
with a True-Trace attachment on an Arrow machine. Cutter is a 1-in. ball-nosed end mill. Hand finishing follows to remove cutter marks that would interfere at pullout

Small core is contour-faced . .
on a Monarch lathe with an automatic hydraulic tracing attachment. Machined surfaces must be finished to prevent sticking

New methods spur metal powder use

Lieutenant Charles Burley, Jr
Manufacturing Methods Division, Aeronautical Systems Center, USAF
Wright-Patterson Air Force Base, Dayton, Ohio

Powder metallurgy has achieved considerable prominence in supplying the appliance and automotive industries with small parts of relatively low strength. However, only during the past few years has significant interest been generated in the production of larger high-strength parts capable of approaching the military requirements for aircraft and missiles.

Common complaints against powder-metal parts are that their grain structure and physical properties are inferior to those in conventional metal-shaped parts. These conditions should not be construed as permanent process deficiencies. For example, eighteen months ago a rolled stainless-steel sheet 120 in. x 240 in. x 0.020 in.—0.060 in. within 2-4% of flatness would have been considered impossible. Today it is a reality.

To obtain sufficient density and strength in powder-metal parts by the *normal* procedure, it is sometimes necessary to repeat compacting and sintering. For the process to remain competitive with other metal-shaping methods, these properties must be achieved with a minimum number of operations.

One approach to upgrading the normal procedure has been through material improvement. Improving the characteristics of the powder particle has resulted in increased flowability of the powder in the die, compacts of improved strength prior to sintering, more homogeneous structures, a greater allowable variation in alloy compositions, reduction of compacting pressures, and increased density.

Refined manufacturing

All these improvements have been attained while eliminating the need for infiltrating or for multiple pressing and sintering to improve the final physical properties. Resultant specimens have exhibited ultimate tensile strengths above 200,000 psi, but the percentage of elongation has been quite low. Nevertheless, the production of powder metallurgy parts by the normal procedure is limited by its dependence on press sizes.

On the other hand, efforts have been made to refine powder-metallurgy manufacturing methods to achieve optimum economies and physical properties or to adapt particular processes to powder metallurgy that normally are associated with other metal shaping methods.

The sintered-aluminum process (SAP) is one example. The high-temperature capability of such aluminum parts requiring structural stability was increased by extruding compacted aluminum powder containing a finely-dispersed, relatively insoluble, aluminum oxide. Other examples are found in the increased operating temperature capability of titanium created by compacting and extruding titanium powders plus molybdenum fibers, and the increased compressive yield strength of magnesium resulting from direct extrusion of magnesium pellets. This latter increase in strength is credited to the fine-grain structure made possible by using magnesium pellets as opposed to the larger grain sizes associated with ingots as-cast.

Precompaction and presintering were eliminated by transferring the pellets directly through pipes to the container. The initial small grain size required less reduction of area during extrusion to obtain desired properties in the final product.

Two paths to travel

There are basically two ways to approach the task of increasing the applicability of powder metallurgy. First, the process, *per se*, can be improved. Second, the process can be used in a supplementary manner to the basic industrial processes of forging, extruding and rolling.

In the first instance there is some doubt as to the tangible results possible. The normal procedure is limited in adaptability because of its dependence on available press sizes. Presses are limited in their capability to produce certain contours or shapes and to yield parts of uniform density due to insufficient or uneven flow of powder within the die. The process, therefore, can be competitive only on a limited scale. Also, maximum attainable mechanical properties, on an economical basis, are less than those possible through conventional metal shaping methods. Finally, it is expensive and difficult to achieve theoretical density, and even then the part does not possess characteristics comparable to a wrought structure.

In the second instance, the use of powder metallurgy techniques for Air Force applications appears to be beneficial. Some of the studies mentioned previously have pointed this out. The SAP process (using a powder billet), the direct extrusion of magnesium pellets, and the extrusion of compacted titanium powder and molybdenum fibers indicate that powder metallurgy can be usefully incorporated into a basic process, such as extrusion, to streamline the operation while increasing the physical properties of the end product. There is no apparent reason why powder metallurgy techniques cannot successfully be extended to rolling and forging operations.

For example, a definite need exists for good quality high-temperature sheet material. For this material, powder metallurgy presents attractive possibilities as applied to the production of sheet by actual rolling operations.

Manage tough materials

As melted and cast, many high-temperature alloys are difficult to work. Some barely respond to any rolling treatment. However, by blending the desired powders needed for a particular alloy, advantage can be taken of the fact that unalloyed, some of the constituents, for example cobalt and iron, possess good rolling characteristics, such as ductility. The powders could be "cold-welded" through roll pressure into a sheet without significant concurrent alloying and consequent loss of workability.

Subsequent to the rolling sequence, a heat-treat operation could develop the desired degree of homogenization and maximize physical properties. It is believed that Russia has used this process to produce beryllium sheets and that improved properties were obtained. Limited work is being performed in this country on various metals. Preliminary results are encouraging.

The powder-metal-producing process of atomization could be extended to produce beryllium powder. Beryllium, for example, presently goes through the processing steps of vacuum-casting beryllium pebbles, chipping the ingot on a lathe, and

ball-milling the chips to powder. It is difficult to control particle size by this technique and recycling is often necessary to yield a uniform product. Facilities are available with which beryllium pebbles could be atomized in a protective atmosphere to a controlled range of particle sizes. The enclosed system would prevent toxicity problems.

Explosive methods

Explosively shaping powder? Strange, but not so strange when one considers the interest in forging explosively, extruding by explosives, and explosive forming. On the surface, this would seem an ideal method for shaping powders, especially refractory metals, because they are reduced from ore to powder. The apparent advantage is increased density; the "wished-for" advantage is an improved or altered grain structure. It is felt that under the conditions of the tremendous force generated by the explosive, as well as instantaneous heat, the normal parameters of compaction may not be applicable. In this case the powder product may more closely approximate similar parts with a wrought structure. On the other hand there are the problems of how to contain the explosive charge, particle conglomeration, and tool "mushrooming" in the die.

Adapting powder metallurgy to forging operations has been enhanced greatly by slip casting. As slip-casting has freed powder metallurgy from its dependence upon press sizes, slip casting could be used to produce "slips" for subsequent forging. It has been suggested that the slip after forging could possess a forged-like grain-flow pattern.

With the successful adaptation of slip casting to forging, the number of steps necessary to produce a forged part would be considerably reduced. Involved would be the reduction of the metal to powder, preparation of the slip, and as many of the final forging operations as necessary to impart optimum physical properties to the end product.

Stainless steel slips, for example, have exhibited a green density of 98% of theoretical and, therefore, require only minimum hot working. Material savings would be realized too, because there would be less material lost through flash and machining. Problems are to be expected, however, as a slip suffers shrinkage during the process of reducing it to its final shape and could result in non-uniform shrinkage and warpage.

All the preceding possibilities for improving manufacturing methods are currently under consideration by the Air Force. It is recognized that products of the powder metallurgy process will never replace extrusion, rolling or forging products of a strictly wrought nature. Similarly, some aircraft and missile parts, such as bulkheads, do not require the ultimate in strength presently obtainable only by normal forging or extruding. Because of the particular function of these parts, they receive a relatively small degree of stress. For this condition powder metallurgy may provide a key to improved producibility.

Although it has been emphasized that utilizing powder metallurgy techniques in the basic processes has resulted in improved end items, the actual choice of which method to use generally will be decided by the economic issues involved.

Three-machine setup cuts piercing costs 60-90%

Making templets

Inspecting templets

Locating and piercing holes

A three-machine sheet metal fabricating setup—templet drilling machine, templet inspection table, and turret punch press—is reported to cut short run piercing costs by 60 to 90%. "Templamation," has just been developed by Wiedemann Machinery Co to produce templets quickly and cheaply, then use them to locate and pierce holes at rates of 30 to 60 spm.

Templets are made on the Coordinator, which locates and drills holes in a single continuous operation with no manual layout. The operator positions the templet blank to X and Y centerline dimensions by using decimal scales and optical scanners. At the proper coordinates he feeds a ¼-in. drill upward through the templet. Templets are produced at a rate of 100 or more holes per hour to an accuracy of ±0.002 in.

The drilled templet is put on the Inspector, a table also equipped with scanners and X and Y coordinate scales, where the hole dimensions are checked at rates of 100 to 150 holes per hour to ±0.001 in.

At the punch press, the operator positions and clamps both templet and workpiece. As the operator moves a stylus, cross slide and workpiece follow. When the stylus point is lowered into a hole in the templet, the work is properly positioned under under the punch, and the press trips. Templet holes are color coded to identify the similarly coded tool station in the turret.

Excellent flow lines . . .

. . . in these etched spark plug shell blanks point up the improved physical properties achieved by cold extrusion. After moly coating (used in extruding) is removed, blanks are completely machined in special automatic bar machines

Automatic feeding . . .

. . . loading, rough and finish machining, and unloading are all done on this 8-spindle Conomatic. Chips drop through machine for easy removal from a pan. Split-track selector orients blanks so they stand on the small-diameter end for delivery to the feed track. Bad parts are automatically rejected

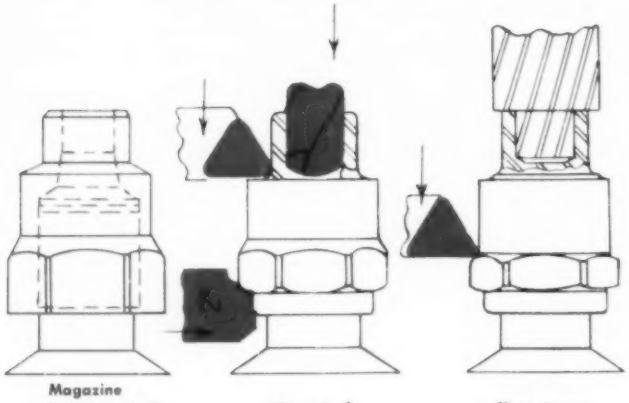
Bar machines team Up

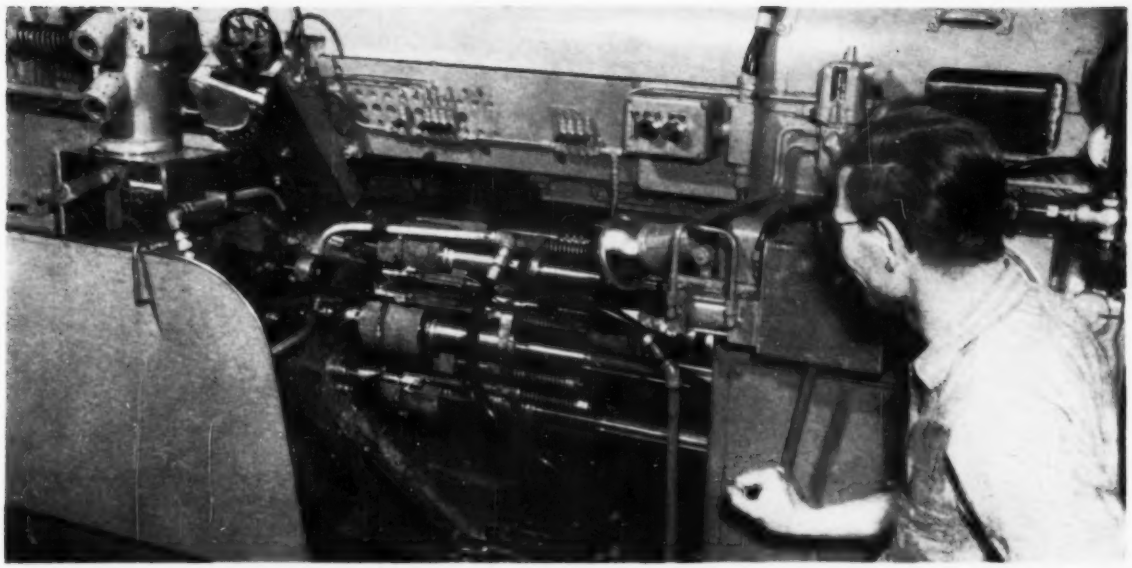
A stronger and better product is beturned out with less (and cheaper) material at General Motors' AC Spark Plug Division through a combination of cold extruding and automatic bar machining. The product: spark plug shells.

Cold-extruded spark plug shells, the AC Spark Plug people have known for a long time, are superior to those made from bar stock. For one thing, they can be made from SAE 110 steel, which is considerably cheaper than conventional bar stock —and about 40% less material is required. For another, the resulting shell is anywhere from 50 to 60% stronger. And to top it all off, much valuable storage space can be conserved because with the cold-extrusion method there is no longer any need for storing tons of bar stock

But the advantages of cold extrusion are frequently offset by manufacturing problems. For instance, high-iron-content materials, which

All parts are supported by three





Carbide tools are used at all machining stations . . .
. . . on the bar machines. In this Conomatic setup, blanks are automatically loaded on a mandrel by means of an auxiliary spindle. Blanks are then form-cut, turned, drilled, reamed, form-shaved, stamped and knurled before they are picked off and unloaded automatically through the agency of another automatic spindle

with cold extrusion to cut costs

simplify extrusion, are particularly difficult to machine.

On the other hand, materials containing sulphur and other impurities are easy to machine, but they're not readily cold-extruded. AC Spark Plug was faced with two choices: either develop raw materials good enough to accommodate both processes, or develop machining setups capable of handling extruded parts efficiently.

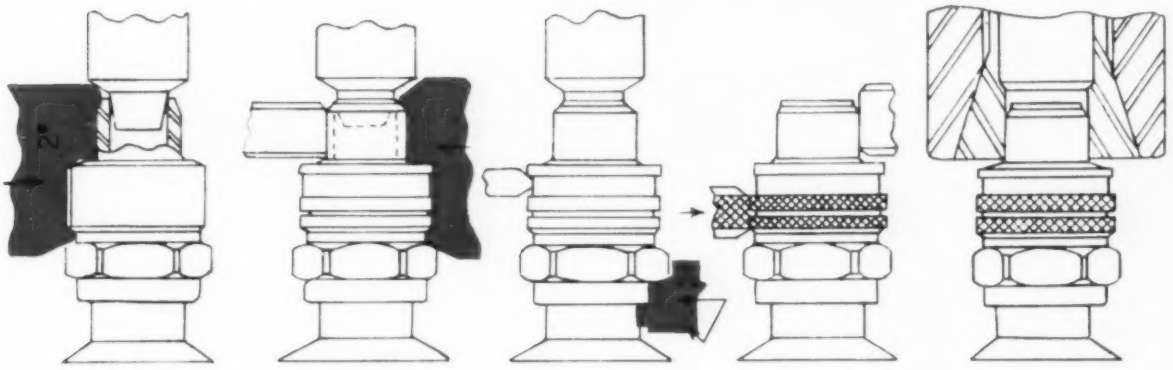
AC Spark Plug, Clifford L Johnson, director of production engineering says, chose the latter course, simply because savings in raw materials far offset the costs of special machining setups.

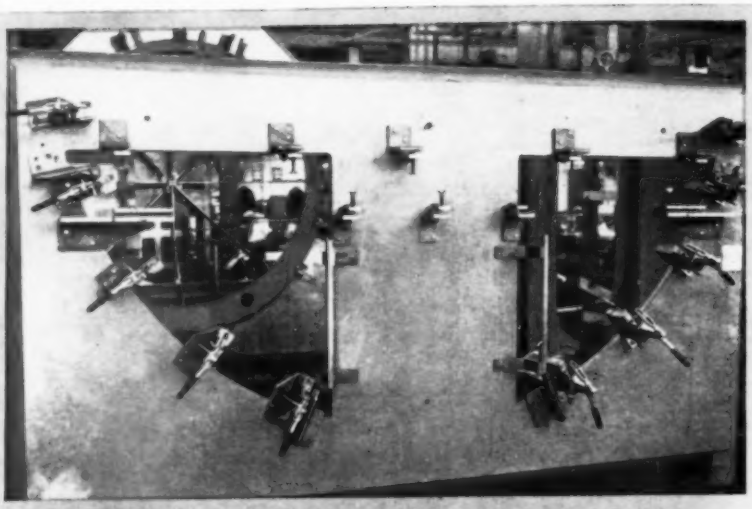
To do the job, AC chose an 8-spindle Conomatic and five 6-spindle Acme-Gridley machines, equipping them with such automating devices as Detroit Power Screw Co vibratory feeders, selector mechanisms, automatic load and unload devices, and auxiliary spindles.

All parts are supported by three auxiliary spindles during machining (see drawing below). The Conomatic (in addition to the spindles) is equipped with an automatic probe that checks each blank to make sure that it has been punched before machning starts. Presence of a solid blank causes the probe to shut the machine off so that tools won't be broken in subsequent stations.

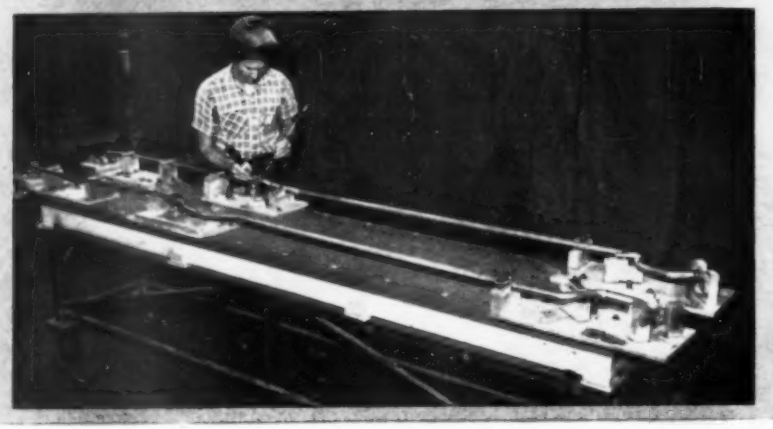
Gross production per machine in 8 hours is nearly 6000 pieces.

auxiliary spindles during machining operations





Large fixture is flat-surfaced with metal-filled plastic instead of being machined for flatness



Lightweight assembly table holds demountable tooling. Its flat, plastic top was cast against a granite surface plate

Plastics make flat surfaces for tools

Instead of machining steel plates to a flat surface, you can cast the flat surface right on the steel with tough, durable plastic.

A granite surface table will act as the casting mold, and a metal-filled casting resin, poured on the table, will duplicate its flatness. The steel plate is then lowered (face down) into the resin and the two become bonded together.

At Grumman, the technique has been employed successfully to make the flat plates required for jigs and fixtures. In another plastics application, the casting resin poured on a surface table has created the flat surface for a lightweight universal assembly table, 10 ft long by 2 ft wide.

Normally, the fixture plates would be machined on a planer. But when this is done, the material must be purchased with extra stock for metal removal, and the job may have to wait its turn for machine time. Then, during the operation, the plate may warp and have to be re-machined, or maybe even scrapped.

Casting a flat surface

Compared with this, the procedure for casting plastic surfaces on the plates is relatively simple, and it can be performed with semi-skilled labor. The only equipment needed is a surface table of adequate size.

The surface table is waxed first with a good grade of paste wax to allow for separation when the plastic has hardened. Then a dam is constructed with 1 x 2-in. steel bars outlining the size and shape of the plate to be surfaced.

The plastic material is a metal-filled epoxy casting resin with a room-setting hardener. This material is mixed thoroughly and then poured onto the waxed surface table to any desired depth, usually ¼ in.

Next, several spacers are placed in the pool of resin to keep the metal plate from settling to the bottom and to establish the thickness of the cast plastic surface.

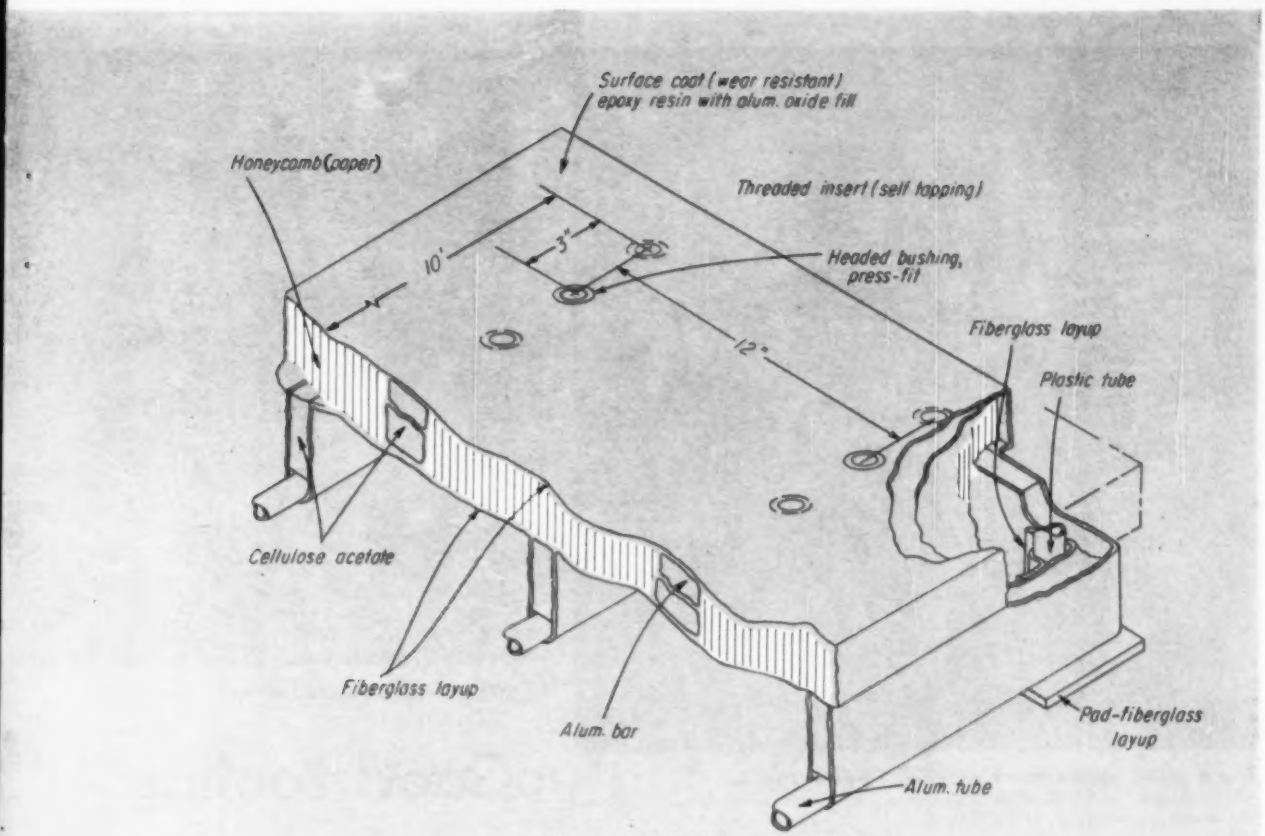
Now the plate is lowered into the plastic (face down) where it bottoms on the spacers. It must be free of oil and dirt—sandblasting works best, but wirebrushing followed by cleaning with a solvent is satisfactory.

The plastic sets in about two hours and can be removed from the table in about four. Normally, however, it is allowed to cure overnight.

This makes a plate with a surface comparable to a surface table. The compressive yield strength ranges from 15,000 to 17,000 psi.

The surface does not rust, of course, and it stands up well under normal shop use. Drilling and reaming may cause a slight flaking at the surface; but the flaking does not affect the alignment or accuracy of the holes.

The method has only a modest advantage on normal, rectangular plates, but it can be a real money saver with very large plates and



LARGE ASSEMBLY FIXTURE IS FLAT-SURFACED WITH METAL-FILLED PLASTIC

and fixtures

By P Bernardo, J Mele and C Watson
Manufacturing Engineering Division,
Grumman Aircraft & Engineering Corp, Bethpage, NY

with unusual outlines such as horseshoe-shaped fixtures, which give rise to special problems in machining.

Building up a lightweight table

The same principle has been used at Grumman to create the flat surface for a lightweight, universal assembly table, which serves as a base for breakdown-type tooling.

In this application, however, there is no steel plate. The thin surfacing material is supported by a build-up of laminated glass cloth, cellulose acetate, and honeycomb fillers, all bonded together with epoxy resins.

The procedure starts out, just as the other one did, with a waxed surface table and with the desired dimensions blocked off by 1 x 2-in. steel bars. Then a surface coat of epoxy resin containing aluminum oxide is applied to the surface table and to the insides of the steel bars. This coat will eventually form the top and sides of the plastic table.

When the surface coat is tacky, two layers of glass cloth are applied with laminating resin, allowing the cloth to extend about ¼ in. above the bars.

Then the two aluminum bars (¾ x 1¼ in.) that run the full length of the table are installed and bonded in place with laminating resin thickened with a suitable agent such as cotton flock or glass flock.

Four layers of glass cloth are laid over this with laminating resin, making six layers of cloth about ⅛ in. thick for the top and sides.

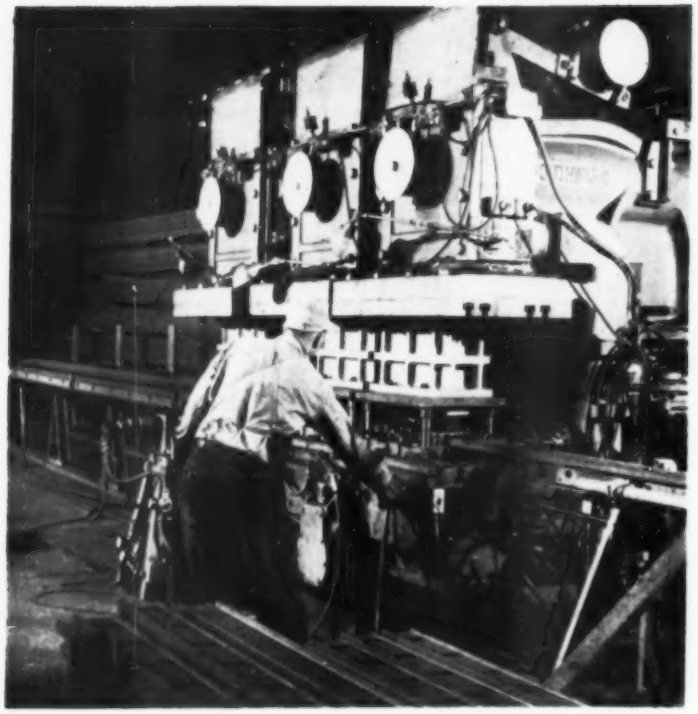
Next, three pieces of 2-in.-thick paper honeycomb are cut and fitted to the areas between the bars. The honeycomb is bonded to the table with thickened laminating resin. Then, the space between the surface of the aluminum bars and the top of the honeycomb is filled with cellular cellulose-acetate foam, also bonded with thickened laminating resin.

Over the assembly, three layers of glass cloth are applied with laminating resin. After the flash protruding above the steel bars is ground off, the basic slab portion of the table is complete. With adequate support, it could be put to work in this form.

However, as shown in the illustration, the Grumman table was built up to include its own base and internal supports.

Then, with the table right-side-up, holes were drilled and reamed through the top and into the aluminum bars. In every other hole a self-tapping threaded insert was installed, and the remaining holes received headed press-fit bushings. These bushings and inserts provide positive location for economical breakdown tooling.

A 10 x 2-ft table fabricated in this manner weighs only 7 lb per sq ft, and with multiple-point support, it is flat within 0.002 in tir. During the past two years six of these tables have given good service in a variety of assembly operations.



Triple press arrangement punches I-beam webs...
with dumbbell-shaped holes on 9-in. centers. Operation is synchronized to move the beam progressivlely through the dies

Workman positions last dumbbell bar...
through punched holes in beam webs. After clamps are tightened, each intersection is arc welded all around and on both sides

Fixtures compensate for weld distortion...

Good tooling

• I-beams, 26 ft long, are web-punched on a 3-press setup operated from a single control.

• Floor grids, measuring 26 x 7½ ft and weighing 4000 lb, are assembled and welded on cambered fixtures that compensate for weld distortion.

These ideas, and others, were worked out by the manufacturing engineering dept at Blaw-Knox Co (Pittsburgh) for efficient fabrication of 700 floor grids for a bridge.

The grids comprise part of the sub-surface structure for the Greater New Orleans cantilever bridge across the Mississippi, the longest of its kind in the US and the third longest in the world.

Each floor grid has 10 longitudinal 5-in. I-beams (1-in. top flange and 1½-in. lower flange), making a total of 7000 I-beams. And the web of each beam had to be punched at 8- to 9-in. intervals with a dumbbell-shaped hole. However, the operation went quickly with the triple-press setup.

Three 175-ton Baldwin-Southwark presses were positioned in a row and equipped with air-powered roll feed, runout table, and unloader, all electrically synchronized to move the 26-ft beam progressivley through the dies. The operator can handle the entire punching sequence with a single control. From this automatic

by slightly cambering 26-ft longitudinal members. Workman here is starting the assembly with sealing-pan strips

ideas speed output of bridge grids

press setup the beams go to a welding fixture where they are assembled with the sealing pan and transverse members to complete the grid.

The sealing pan is made of strips of special corrugated sheet, cut to slightly over 4-ft lengths. The edges of the strips bear against the longitudinal I-beams and their raised center portions contact the transverse members.

After the sealing-pan strips have been installed in the fixture, the beams are positioned on 9-in. centers. Then the transverse bars, $2\frac{3}{4}$ in. deep and of so-called dumbbell section (bulb-I), are slid through the punched openings in the webs.

Once the parts are all in place, the beams are pulled down tightly by 70 hold-down clamps. Air-driven tools speed the clamping. The beams are slightly cambered to compensate for distortion in welding.

In the assembly there are 36 dumbbell bars passing through the 10 I-beams. Each of the resulting 360 intersections is manually arc welded all around.

To weld the grid to the sealing pan, intermittent fillet welds, about $1\frac{1}{2}$ in. long on 5-in. centers, are laid along the understrip and both longitudinal and transverse beams. The welding sequence was worked out carefully to minimize and balance out the heat effect.

As the welding is performed in the flat position, high travel speed and maximum penetration are achieved with a high-speed, iron-powder electrode, Lincoln's Jetweld 1 (AWS E-6024).

The completed grid is dip painted in a narrow tank while suspended from one edge by an overhead crane. Finally, it is barge shipped in lots to New Orleans.

Modernize to increase profits, drop forgers told

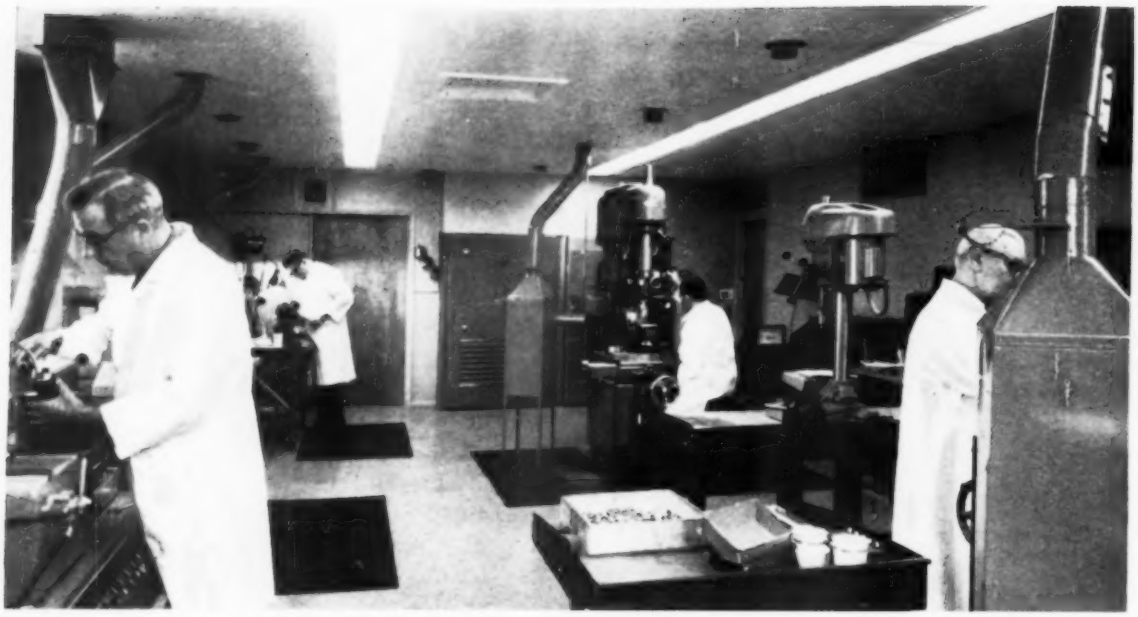
U S drop forgers, hampered by a high labor cost per dollar of sales, are planning to step up research, development and modernization programs in an effort to widen their profit margins.

Speaking at the Drop Forging Association's annual meeting in Spring Lake, N.J., June 21-24, Chevrolet's E. S. Wellock said that three basic attainments can help any independent drop forger achieve maximum cost efficiency:

- A corporate structure that provides earnings for modernization.
- Suitable plant and location.
- A balanced organization made up of personnel retrained to do a better job. With 80% of productivity depending upon operator efficiency, a premium should be placed on well-trained supervision—and technical personnel must be brought up to date on newest techniques and tooling.

Reducing the labor content of a shop by modernization was discussed by Eugene C. Clarke, Jr., president, Chambersburg Engineering Co., who discussed the modernization profile of a typical forge shop before and after being upgraded by automatic processes.

Steps toward this goal, Mr. Clarke said, are mechanization of (1) materials handling, (2) feeding, (3) heating, (4) preforming, (5) forging, (6) trimming and hot shearing, (7) auxiliary operations.



Employees are protected from toxic beryllium dust by high-velocity exhaust system, proper procedures, and careful attention to cleanliness. Unducted machines such as the sensitive drillpress at right are not yet cutting beryllium

Small company places big bet on beryllium

"Success in machining beryllium depends 90% on careful planning in the office before the material ever goes into the shop," says Patrick F Farrelly, president of Alsca Beryllium Machining Corp.

The sequence of operations is particularly important—even critical—because an operation lineup that would work with other materials might produce nothing but scrap when applied to beryllium. And, that's expensive scrap, too.

Alsca, a small company, has placed a big bet on the future of beryllium and claims its new plant at Valley Stream, NY, is the first one in the US designed and built specifically for machining this strong, exceptionally light-weight material.

Here, too, careful planning was important, not only because of the toxicity hazard, but also because of the kind of sub-contract work the company expects to do. Most of it will probably be in small, high-precision parts for instruments and guidance equipment.

Tolerances on such parts are often as close as ±0.000,025 in., and surface finishes must be 32 to 16 mu in. In addition, the print may say "45-X deburring," i.e, the part can't show any burrs when inspected through a 45-power microscope.

To meet specifications like these, the plant has all new machine tools built to perform precision work. Too, a summer and winter air conditioning unit holds the temperature at 70 F ± 1°. In the separate inspection room the spread is only ± ½°.

On the low-volume work Alsca has done during its first six months, good surface finish and accuracy with minimum scrap have been far more important than a high rate of output. In fact, most of the machines are hand fed, and the company counts on the educated touch of experienced machinists to produce quality parts.

Will develop machining stds

However, complete records will be kept of the machining problems that arise and the way they are solved so that past experience will be a direct aid on future problems.

But toxicity is an even more important consideration when machining beryllium. In the form of finely divided dust, chips, or vapor, it can cause serious lung disorders similar to silicosis. Because of this the Atomic Energy Commission has recommended that the atmospheric concentration of beryllium within a plant should not exceed 2 micrograms per cubic meter. Outside, it should not exceed 0.01 micrograms per cubic meter.

To meet this standard, early beryllium-machining shops went to the extreme of completely enclosing the cutting zone in a hood with transparent viewing ports (*AM*—Feb 19 '51, p133, *et seq*). Alsca, on the other hand, puts its faith in a high-velocity exhaust system with a flexible duct positioned as close as possible to each cutting tool.

The company's faith in its system was justified when tests made by the New York State Labor Department showed that atmospheric contamination was well below the prescribed limits. Hourly or daily checks are not considered necessary.

One feature of the exhaust system is the "trap" at each machine. If a man is careless and lets a part or a micrometer be sucked out of his hands, it will drop to the bottom of the trap instead of continuing into the mechanical-electronic air cleaners on the roof. It'll stay in the trap, too, until operations are suspended for a thorough, periodic clean-down.

But safety precautions do not end with the exhaust system. The shop is kept locked at all times, and keys are issued only to authorized personnel. Employees are issued disposable paper clothing which is incinerated at the end of the day. And of course, the shop and machines are kept scrupulously clean.

The impact of VALUE ANALYSIS

By Tom Johnson, associate editor

Twelve years ago, in 1947, the Value Analysis program at General Electric was established. Two years later (July 14, 1949) *American Machinist* published the first major article on Value Analysis to appear anywhere outside General Electric. During the past decade, Value Analysis has become one of the most widely imitated techniques in industry—and for good reason. Here is a program of product improvement and cost reduction that can save a large company millions of dollars a year. And more and more small companies are discovering that VA techniques can be put to work in their plants.

In 1947, the Value Analysis program was a one-man operation; today it is one of the most vital links in the vast General Electric chain of decentralized operations. Because the program has been such a huge success, and because it is of great interest to Metalworking, *American Machinist* feels that its readers ought to know what has been happening to the program during the past decade. Here's what you'll find in this Special Report:

- **A re-statement of the philosophy of Value Analysis**
- **Where Value Analysis stands today**
- **A detailed description of the way in which the company trains its Value Specialists**
- **Example after example of "before" and "after" value-analyzed products and components**

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TESTS FOR VALUE
Our Challenge—Our Obligation
Every material, every part, every operation must pass these tests
★ ★ ★
1. Does its use contribute Value?
2. Is its cost proportionate to its usefulness?
3. Does it need all of its features?
4. Is there anything better for the intended use?
5. Can a usable part be made by a lower cost method?
6. Can a standard product be found which will be usable?
7. Is it made on proper tooling—considering quantities used?
8. Do material, reasonable labor, overhead and profit total its cost?
9. Will another dependable supplier provide it for less?
10. Is anyone buying it for less?
VALUE ANALYSIS SERVICES
GENERAL ELECTRIC

Tests listed on this certificate . . .
are applied to every job that the Value Analysis staff at General Electric undertakes. To build optimum value into a product, **the Value Specialist must be free to probe deeply into a wide range of** operations. Every phase of product development—design, engineering, purchasing, manufacturing, marketing—must be investigated

The impact of VALUE ANALYSIS

Some time ago, the Value Analysis group at General Electric was asked to examine one of the company's transformers. What suggestions, the group was asked, did it have that might improve the transformer's design, its performance, its method of production, its components, its cost of manufacture? What management wanted was a broad but profound analysis of the whole manufacturing process—from design to packaging—that went into the making of the transformer.

On the face of it, suggesting that manufacture of a GE transformer might be improved is like telling the world's greatest chef that his prize sauce isn't properly seasoned. Yet the VA group, after extensive analysis of the transformer, made several recommendations that not only gave the company a better product but reduced its cost of manufacture.

Here's one of the group's suggestions, all the more striking because the idea, in retrospect, seems so simple: Substitute wooden washers for the fiber washers (about as big as a checker-piece) used as insulator-spacers in the transformer.

For years design had specified fiber washers, which at that time cost $9.83 a thousand. But the Value Analysis group discovered that a thousand maple washers would cost the company only $2.40. And the group also knew that the company bought hundreds of thousands of these washers every year.

The result: A substitute part—one that performed the same function as reliably as the original—saved the purchasing department $12,000 a year. If the group had not been in existence, the company would probably still be spending an extra $7.43 on every thousand washers it buys.

This cost reduction, although significant, is a small detail in a company with a budget as big as General Electric's. But multiply it by several hundred similar recommendations made each year, and you'll get an over-all picture that reveals savings of millions of dollars a year. And there are other benefits that are equally as important, though not so dramatic at first glance: product improvement, a more unified approach to the manufacturing process, and more competitive selling prices.

It has been ten years since AMERI-

L D Miles . . .
was a one-man task force when GE set up its Value Analysis program in 1947. Today he heads an operation that includes 120 full-time Value Specialists in the company's widespread plants

CAN MACHINIST published the first article on Value Analysis that appeared anywhere outside General Electric. The techniques described in this article by L D Miles (then, as now, head of the GE Value Analysis Division) have been applied thousands of times since then, and the group's experiences have led to refinements and standards that give Value Analysis a unique, permanent place in the GE setup.

From the standpoint of proved application, Value Analysis is probably the most successful managerial tool of the past decade. It is also one of the most widely copied. The Department of Defense, generously assisted by GE in developing techniques, has active Value Analysis programs (one program in the Navy's Bureau of Ships, for example, saved $8 million in three years). Private industry has followed suit: A healthy number of companies—aircraft, electronic, automotive—have installed programs. Whatever their extent, or the names that these companies give them, these programs are essentially based upon the general concept that GE initiated in 1947: Objective appraisal of products by an independent, unbiased group within the organization.

The First Dozen Years

Today, twelve years after its inauguration, what is the position of the Value Analysis program at General Electric? Very solid, the observer must admit. In 1947, L D Miles ran a one-man operation. Here's the picture today:

- GE has 120 full-time analysts in its far-flung plants.
- Each of these analysts is expected to save his plant an average of $200,000 a year.
- Intensive seminars, held periodically in Schenectady, are training future analysts.
- In-plant seminars, taught by these trained analysts, acquaint management and engineering personnel with Value Analysis techniques. Some participants — designers, draftsmen, manufacturing engineers, purchasing men, and others—are encouraged to generate and bring into focus better alternatives in product manufacture. And the management people who attend the seminars are shown how an awareness of Value Analysis can contribute to sound decision making.
- Frequent publications by the Value Analysis group, distributed to all GE plants, keep Manufacturing, Purchasing, Design and all other interested groups abreast of new developments in materials, components, and services.
- A new technique, Value Control, has arisen from the experience with Value Analysis. In the future, the group hopes to provide value data that will greatly influence the design, raw-material, and production phases of new-product development. Optimum value will be built into products before they're made, not afterwards.

One further development—perhaps the most important of all—has emerged: Today everyone in General Electric has a much better idea of what *value* means to the company. Value Analysis is as much a philosophy as a practical technique. And before the technique will work, the concept of value has to be grasped.

What Is Value?

What is value? Ask a dozen people and you'll probably get a dozen answers. For value—like sex appeal and legal justice—is an abstract concept that embraces an army of meanings. Try to answer the question "What is the value of a dollar bill?" and you'll see how difficult the semantics is.

If the concept is abstract, the results are all too apparent in a company that is confused about the value of its products. Here each division of the company has its own private definition of value. And when there is no meeting of minds, true evaluation of products is impossible. Opportunities for cost cutting and product improvement—opportunities that should be obvious—never even get a chance to come to the surface.

Consider the usual attitudes in a company that makes, say, an electrical appliance. The designer of the appliance equates value with function and reliability. To the purchasing agent, value means getting the best materials, at the cheapest price, to make the appliance. The production man's definition of a product's value is what it costs him to manufacture it. The sales department thinks in terms of the marketplace, the value that the consumer is willing to place on the finished product. To top management, the appliance's value is a reflection of several factors that influence balance-sheet arithmetic and stockholder attitudes: worth, esteem, cost, price, demand, profit.

Here are some of the things that this lack of focus can bring about:

- A reliable appliance may come off the designer's drawing board, but with built-in features that are too expensive for production.
- The purchasing agent may buy the materials specified in the design, without being aware that new, less

BRUSH HOLDER
Left: Bronze sand casting, machined, cost $6.68
VA Proposal: Use No. 6 yellow brass, cast and machined
Right: Present cost—$1.48

BLADE
Left: Sand casting, cost $4
VA Proposal: Switch to forging
Right: Present cost—50¢

expensive, equally reliable alternates are available.

• The production man may custom-build the appliance from scratch, without realizing that outside shops with special facilities can mass-produce certain components at far less cost.

• The sales department, pricing to match competition rather than reflect cost of manufacture, may find that the profit margin is wiped out.

• The absence of a clear definition of value may force management to make decisions that are not based upon sound judgment.

Here imagination and inventiveness are stifled, because each element of the company has a different philosophy of value. And it is precisely these conditions that Value Analysis is designed to overcome. The VA group first had to find a common definition of value, then get all divisions of the company to recognize it, and finally put the definition to work.

As with all new concepts, there was a great deal of static friction to overcome. Quite naturally, certain departments reacted strongly against suggestions that their work might be improved. The Value Analysis group has compiled a list of typical reactions: It won't work. . . . Yes—but we're different. . . . It's the best design. . . . You can't take any more cost out. . . . We always make it that way. . . . We can't rely on anyone else. . . . Lower cost means lower quality. . . . Why change it? It works. . . . It won't work—we tried that twenty years ago. . . . We know more about that than anyone else. . . .

These attitudes, natural reactions to outside interference, have changed radically in the past few years. The illustrations that accompany this story show, perhaps better than anything else, why this change has come about.

Value, GE-Style

The Value Analysis definition of value is not a difficult one: Value is the lowest price for the required function or service at the desired time, place, and with the essential quality. Stated somewhat different-

Cost reductions . . .
that Value Analysis makes possible are illustrated by examples to the left and on following pages. In each example, original part is shown at left (or top), new part at right (or bottom). Each new component must have same quality as, or better quality than, the original

ly, a part's real value is the lowest price at which it performs a given function reliably.

The key word here is *function*. The Value Analyst thinks in terms of function and acts in terms of function. His first thought in examining a product or component or material is of its function. When he first undergoes training, he is encouraged to forget traditionally sacrosanct terms like price, quantity, type of hardware, and appearance—there will later be time, he is assured, to ponder over what to do about all these things.

Basically, the VA expert examines a part in a series of logical steps that generally take this pattern:

1. What is the part?
2. What is its function?
3. What does it now cost?
4. What else would do the job?
5. What would that cost?

Simple? Not as much as you might think, for Value Analysis implies more than just value consciousness. The analyst must be prepared to act, to recommend. As Larry Miles succinctly puts it, "You don't learn how to play golf by reading about it." If awareness is half the job, the ability to act is fully as important.

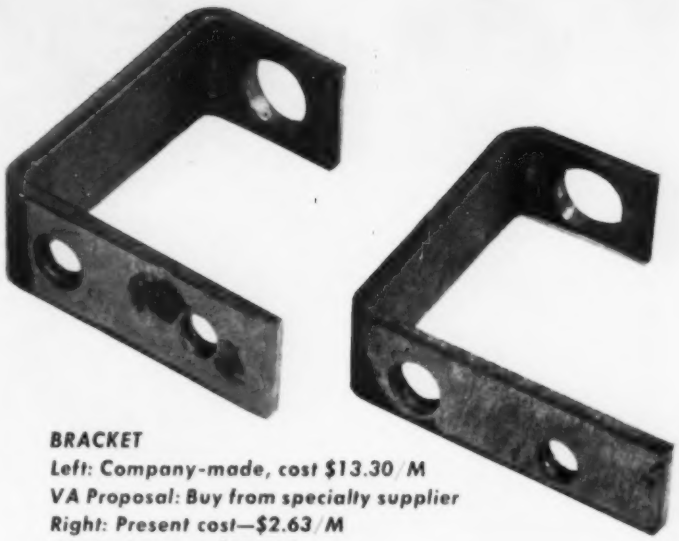
The success of the Value Analysis program, then, is the result of two factors:

1. The ability to think in terms of function—an approach never before tried on such an intensive, large scale in industry.

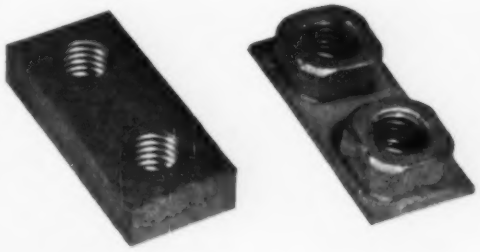
2. The ability to act upon conclusions reached in the analysis of a part or product.

People in the VA group like to emphasize that theirs is not just another cost-reduction program. Actually, they have sometimes recommended that a component be replaced by a more expensive one. Reason: The higher-priced part performed the function more reliably than the original, or performed more functions. In most cases, however, the cost reduction is one of the more striking results of the analysis of a product.

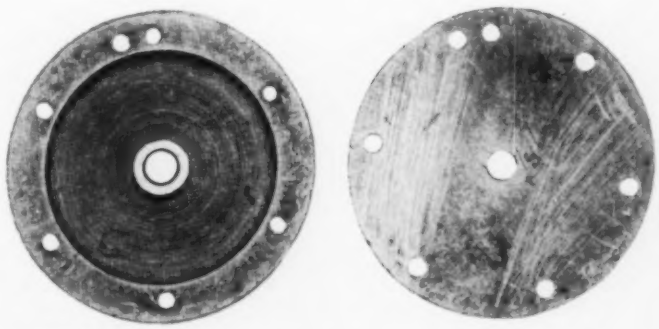
What areas of General Electric fall under Value Analysis's surveillance? The answer—literally every phase of product development and manufacture. Planning, design, purchasing, production, packaging, shipping—all divisions that are concerned with a product will sooner or later come into contact with the Value Analysis group. And because the group has not been afraid to cast a cold eye on all phases of product development and manufacture, it has



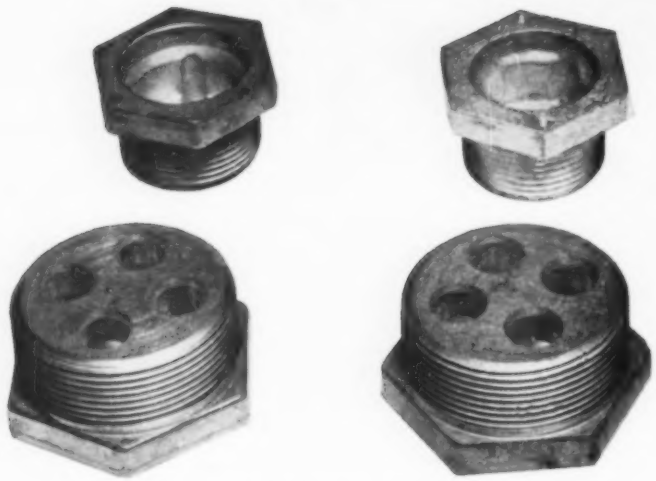
BRACKET
Left: Company-made, cost $13.30/M
VA Proposal: Buy from specialty supplier
Right: Present cost—$2.63/M
Yearly Savings: $10,670



CLAMP BAR
Left: Machined from barstock, cost 32¢
VA Proposal: Use two nuts welded to ⅛-in. stamping
Right: Present cost—8¢



DIAL HUB
Left: Machined steel, cost $1.27
VA Proposal: Buy available aluminum disk from bulk supplier, flatten and drill
Right: Present cost—13¢



BRASS IMMERSION-HEATER PLUG
Left: Forged, cost $79.70/C
VA Proposal: Shell-mold it
Right: Present cost, $26/C

CAM
Left: Fabricated (5 stampings, 2 rivets), cost 12¢
VA Proposal: Buy 1-piece, sintered-iron units from specialty supplier
Right: Present cost, 3¢

IMPELLER CASTING
Left: Cast bar, machined and milled, cost 40c
VA Proposal: Buy powdered-iron casting (no machining required) from specialty supplier
Right: Present cost—10¢
Yearly Savings: $60,000

been able to initiate some radical changes in traditional methods of getting things done. Here are some examples:

CHANGE IN MACHINING:

A J-bolt used to be made on a screw machine for 11½¢. VA recommended that roll-threading do the job. Present cost: 1½¢.

CHANGES IN FORMING:

A simple hinge, once a stamped part that cost 37¢, now is a roll-formed strip that costs only 27¢. Saving for the company is $50,000 a year.

A cover latch that used to cost 44¢ now can be made for 11¢. A wire-forming technique recommended by VA brought the price down.

CHANGES IN MATERIALS:

An arcing horn, originally made of bronze by brazing, cost the company $6.80. A year ago, making the horn as a shell-molded casting brought the price down to $3.20. Now a new design is being tested (with the likelihood of complete approval) that will further reduce the cost.

USE OF NEW MATERIALS:

An impeller casting originally had to be milled after casting. Now it is formed of powdered iron. Price reduction: from 40¢ to 10¢.

A cap for a lightning arrester used to be made of porcelain; now it is molded of glass-reinforced polyester at a substantial saving.

CHANGE OF SUPPLIER:

A plug to protect a turbine opening during shipment was originally machined in the plant, at a cost of $15. Buying the part—a standard fitting—from a plumbing shop reduced the price to 40¢. Subsequently VA recommended that the part be made of Masonite, reducing the price still further.

These examples, together with the photographs that appear elsewhere, show the diversity of the Value Analysis effort. In retrospect these achievements are deceptively uncomplicated. Their *ex post facto* simplicity may even prompt the skeptic to criticism. "Anybody," he will exclaim, "should have been able to do these things."

The point is, however, that anybody rarely does, at least to such an extensive degree. It isn't unusual, of course, to hear that a company has saved money by using a newly developed material or by successfully solving a "make or buy" prob-

lem. But these generally are isolated efforts—attempts to solve specific problems rather than concerted studies of all phases of product development.

The Value Analysis program recognizes that in industry (especially in large companies with a multitude of products) there is often a tendency toward inertia. Once a product has been successfully launched, it will probably be made in much the same way—with the same materials and components—for years. The objective, outside look is missing, and suggestions for improvement never even occur to the people most intimately concerned with the making of a product.

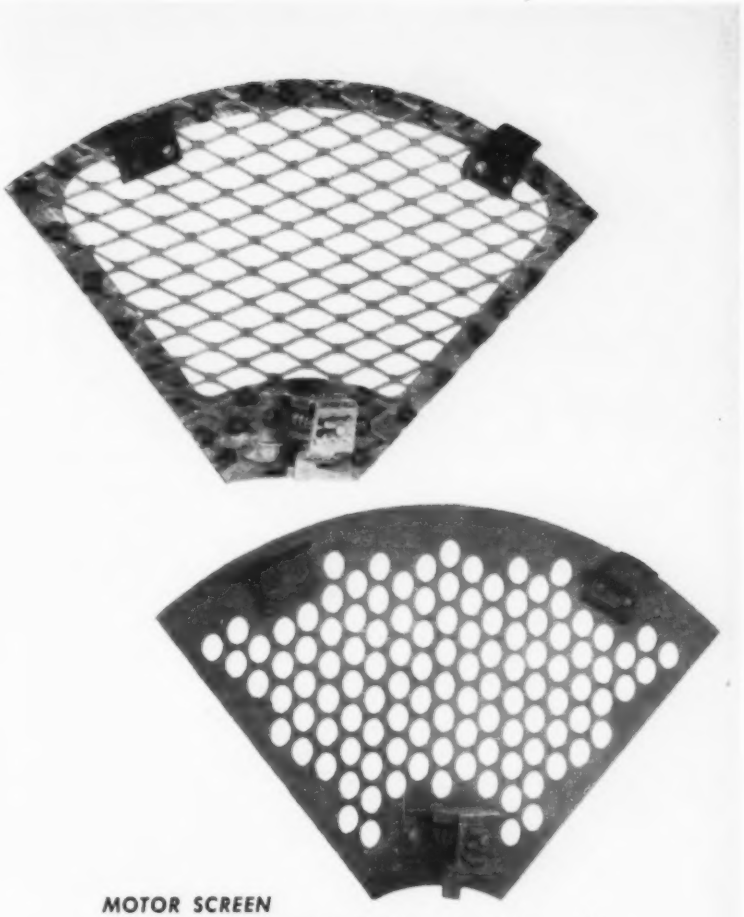
If the skeptic persists in his criticism, the VA expert's reply is likely to be something like this: "Why not analyze your own products? I've been looking at one of them. It's a good product, and it performs reliably. But you should be able to make it for far less money. Why don't you try to reduce the cost of manufacture 30%, without sacrificing any of the product's quality or reliability?"

Once the problem is stated this way, the skeptic realizes that Value Analysis is much more complicated than the results of its work apparently show. And it is precisely this sort of problem that the VA group at General Electric has been solving for the past twelve years. How each problem is stated, and how it is solved, can best be illustrated by describing the approach that General Electric takes in the training of its Value Analysts.

Training the Specialist

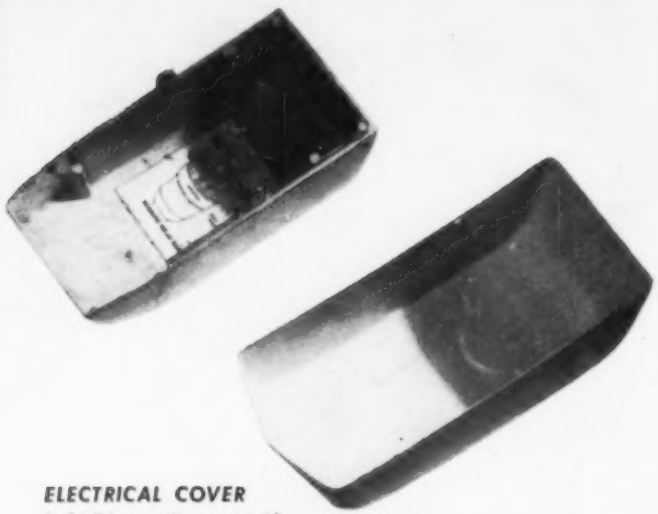
Periodically, the Value Analysis Service holds courses in Schenectady, designed to acquaint GE personnel with the various aspects of Value Analysis. Some courses are general approaches that introduce the subject in broad terms to management personnel. Others are restricted to special groups: Engineering personnel receive instruction that helps them to achieve optimum value in design work; marketing and sales people study ways to use Value Analysis in their work.

The most intensive course taught at Schenectady is a two-week seminar designed for GE personnel who will become Value Specialists in their plants. Here the implications of value are studied in depth; management men and engineers from GE plants work together as a team, learning VA techniques and applying them.



MOTOR SCREEN
Left: Expanded metal, with 40 spot welds, cost $6
VA Proposal: Use perforated metal stamping
Right: Present cost, $1.20
Yearly Savings: $22,776

THRUST PLATE
Left: Machined plate, cost $1.35
VA Proposal: Produce by stamping
Right: Present cost, 16¢



ELECTRICAL COVER
Left: Die casting, cost 60¢
VA Proposal: Substitute steel stamping
Right: Present cost, 21¢
Yearly savings: $39,000

VALVE
Before: Worn valves replaced with new ones
VA Proposal: Reclaim to new-valve quality
Now: Reclamation costs average less than 60% of original costs

And the learning process is not purely academic: Students work on a GE product during the course, and are expected to make recommendations that will lead to substantial savings without sacrificing any product quality.

Candidates for the course are carefully picked, and are expected to bring certain qualifications to Schenectady with them. These extracts from the announcement for a recent seminar precisely define the scope of the course:

"**Broad Description:** A ten-day depth course in *Value* designed to provide a sound working knowledge of Value Analysis which will enable participants to produce equal or better quality products and service at a substantially reduced cost. The program includes an extensive study of Value Analysis techniques, the relationship of Value Analysis to other functional activities, and presentations and displays by over 50 specialty vendors, company specialists, and consultants. In addition, each participant applies Value Analysis on a company product to obtain the lowest cost for reliably performing the function.

"**Participants:** Designed for men who will be assigned as Value Specialists and key personnel from engineering, manufacturing, finance, and materials functions who will be assigned responsibility for leading Value Study teams.

"**Qualifications and Experience:** Engineering or methods and planning background. Understanding of materials. Creative imagination. Initiative. Self organization and drive. Ability to work with minimum supervision. Desire to obtain good value. Ability to work with others. Three to thirty years' experience.

"**Other Information:** This program is designed to substantially increase the effectiveness of all personnel regardless of the phase of business in which they operate. Value Analysis training creates a frame of mind or mental approach that insists on continuous inquiry, that is intolerant of complacency. In addition, it organizes the thought processes and provides the techniques for obtaining optimum value—'The Lowest Cost for Reliably Performing a Function.'"

Establishing the Project

On his very first day at the seminar, the participant is given the project that he, working as a member of a team, has to solve. Essentially, he is told something like this:

"Here is a General Electric motor,

It's a recent development that hasn't appeared on the market yet. Right now it performs reliably and its quality is well up to company standards. Our marketing people tell us that there is a real need in industry for a motor with this rating. Unfortunately, material and manufacturing costs are high and we can't meet the selling prices we must expect from our strongest competition. Your problem, gentlemen, is a simple one: At the end of the course, submit recommendations that will reduce cost of manufacture 30%, without reducing the motor's quality or reliability." (This problem, a hypothetical one here, is typical of the type that Value Analysis teams are called upon to solve in every-day practice.)

At this point the leader of the seminar may add a few remarks: "Here it is, gentlemen. We think we can give you the tools to cut costs 30%. But meeting this goal is your job, and you have exactly ten days to do it."

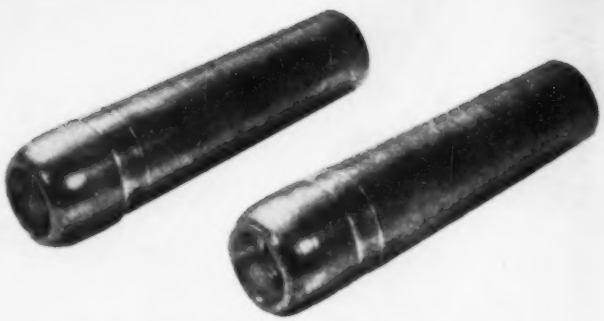
Once the problem has been explained, the whole class gets a detailed briefing on the motor. Here are some of the data furnished by the instructor:

- Present costs of each component in the motor
- Names of present vendors
- Drawings and specifications
- Estimated quantities of components used each year
- Materials specified
- Design and performance data
- Planning and manufacturing paperwork and control procedures
- Present methods of fabrication and assembly
- Manufacturing cost and time data

To answer any further questions, project consultants are on hand. These consultants are men who know in great depth particular technologies that apply not only to the current project but to many others. Some may come from GE laboratories, others from vendor companies. Their advice may be freely solicited on such items as machining processes, insulating techniques, electric-current interruption, coil winding, magnetic steels. And in addition to the consultants, GE engineers and manufacturing men in the area are, of course, readily available for other information.

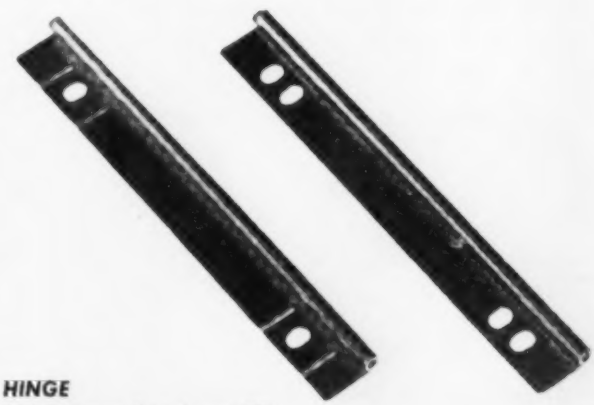
Philosophy of the Project

While the participants are becoming acquainted with the project, they also receive an introduction to the



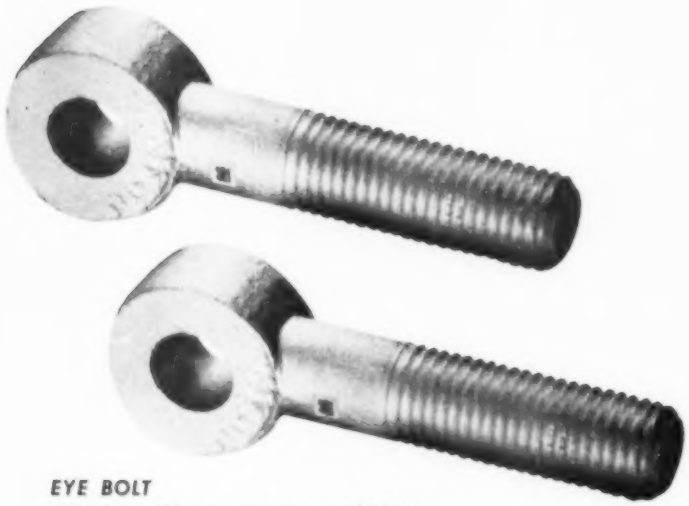
SOLDERING-IRON TIP HOLDER
Left: Made on screw machine, cost $52/C
VA Proposal: Produce by forging and machining
Right: Present cost, $31.46/C
Yearly Savings: $21,500

ROTOR END PLATE
Left: Casting, cost $8.76
VA Proposal: Substitute forging
Right: Present cost, $1.67

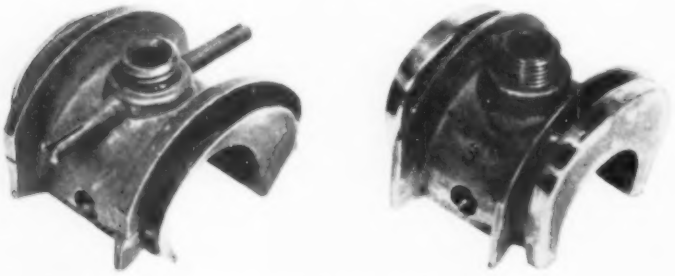


HINGE
Left: Stamped part, cost 37¢
VA Proposal: Buy roll-formed strip from specialty supplier
Right: Present cost, 27¢
Yearly Savings: $50,000

RESISTOR ASSEMBLY
Left: Original design cost $7.82 each
VA Proposal: Redesign assembly to permit use of a tapped vitreous-enamel resistor
Right: Present cost, 94¢



EYE BOLT
Left: Forged by company, cost $27.60
VA Proposal: Purchase from standard supplier
Right: Present cost, $1.86



INSERT FOR INFLECTION YOKE COIL
Left: Machined, cost $87.50
VA Proposal: Produce by investment casting and machining
Right: Present cost: $29
Yearly Savings: $29,250

philosophy of Value Analysis. A series of lectures, given at frequent intervals during the course by experts from the Value Analysis Staff, outlines the plan of attack.

A key initial step is to make the trainees think in terms of function rather than hardware. What happens when hardware—and its cost—are prime considerations in product development? To illustrate the danger here, the VA instructor shows twenty objects, bought in a local hardware store, to the class, asking each person to estimate the value of each. Objects may include an 8-penny nail, a threaded hook, a clothesline pulley, a drillpress chuck, a window stop, a paint scraper—small, inexpensive articles that everyone is familiar with.

When the actual prices of these objects are revealed, and the participants see how widely their estimates have missed the mark in most instances, the point has been firmly made: Don't try to establish the value of an object by thinking of it as a piece of hardware.

Think of the object's function, the class is told. What is the part? What is its function? What does it now cost? What else would do the job? What would that cost?

At once these questions are directly related to the group project. What is the function of the motor? What is the function of each part in the motor? What does each part now cost? How can each part be redesigned, remade, repurchased yet still perform the same function as reliably as or better than the original? How much would it cost to make each part?

All these questions are answered in depth during the remainder of the course. Each day the seminar meets, the implications of the questions are revealed in a series of talks given by specialists on the Value Analysis staff and from other GE departments. The following talks, only a portion of the total made at a recent seminar, give a good idea of the broad yet deep approach:

"What is Creativity?"

"Costs—Get Them, Know Them, Use Them"

"The Need for Good Human Relations"

"Determine the Basic Function of Your Project"

"How to Analyze Your Project"

"Work on Specifics, Not Generalities"

"Search Out the Best Suppliers and Specialists"

"Use All the Company Services"

"Relationship of Value Analysis to Other Functional Activities"

"What's New in Manufacturing Processes?"

"Ten Tests for Value"

"Let's Get More Value in the Original Design"

"What Management Expects From a Man Who Has Had Value Analysis Training"

"Value Analysis and Cost Improvement"

"The Work of a Professional Value Specialist"

"Where Do We Go From Here?"

The Right Attitude

The trainee's introduction to Value Analysis consists, then, of an orientation in two major fields: He finds out what project he is to work on, and at the same time is thoroughly indoctrinated in the concept that will enable him to meet his goal. To these might be added a third orientation: Creation of an attitude that will lead to success.

Quite naturally, the participants bring to Schenectady many prejudices that make innovation difficult: "It's the best design." "We always make it this way." "Why change it? It works."

Much emphasis in the course is placed on accentuating the positive, on breaking down the negative attitudes that restrain the creative mind. No idea, the trainee discovers, is too small for consideration. Imagination should stray far afield of conventional boundaries. No product is perfect in itself, cannot be improved in some way.

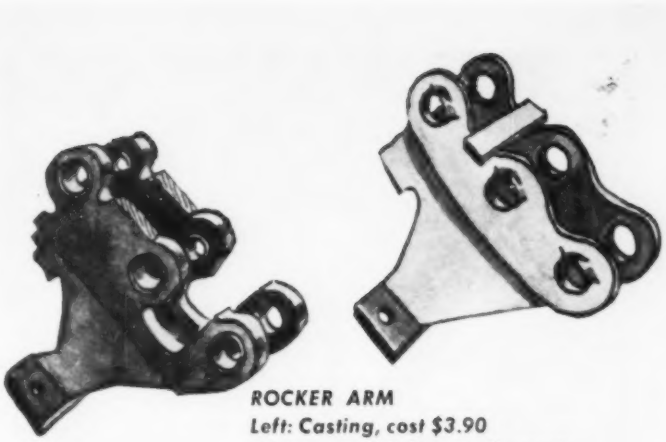
Here are some of the positive attitudes that every Value Specialist must have:

- We must want something new to work.
- There must be a better way.
- We all make mistakes.
- We are all on the same team.
- We have no supermen.
- A major contribution to the art makes further progress possible.

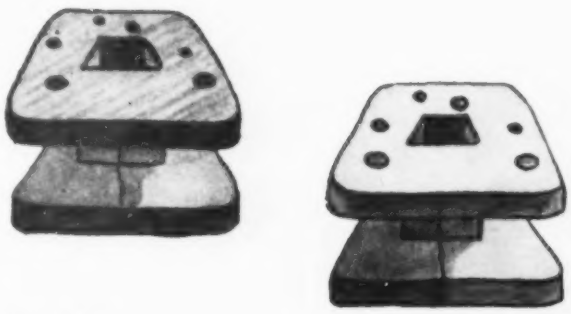
The VA Job Plan

The seminar approach to the project is to divide the class into several teams (usually three men to a team). In the example selected here, each team is given responsibility for some component of the motor. One team might work on the conduit box, another on the rotor, another on the bearings. Still other teams would concentrate on the winding, the insulation, the housing, the fan, the method of packaging.

Each team is expected to establish



ROCKER ARM
Left: Casting, cost $3.90
VA Proposal: Fabricate the part
Right: Present cost, 90¢



COIL FORM
Left: Molded plastic, machined, cost 40¢
VA Proposal: Try injection-molded nylon
Right: Present cost, 3¢

SPACER STUD
Left: Made on screw machine, cost 7¢
VA Proposal: Buy cold-headed part from specialty supplier
Right: Present cost, 2¢
Yearly Savings: $12,000

Future Value Specialists receive their training in seminars held periodically at Schenectady. Training of these carefully selected men is by no means purely academic. Participants apply VA techniques to a company product, are expected to submit concrete proposals that will increase the product's value

GENERAL ELECTRIC COMPANY
VALUE ANALYSIS SERVICES

VALUE ANALYSIS SUGGESTION SHEET

TABLE NO. _____
DATE _____

Suggestion sheet submitted by the Value Specialist contains his final proposals on each part that shows possibilities for improvement

the optimum value of the component it works on. It must investigate every source that goes into the making of the component: design, manufacture, materials, suppliers, control methods. But because the end product consists of components that must function smoothly together, there are frequent exchanges of notes between teams. Of necessity, each team is dependent on all the other teams.

Training that accompanies the project work follows standard procedures set up for Value Analysis of any product. At the beginning of the course, all teams are introduced to the formula that has solved so many value problems in the past. (See the opposite page for a detailed description of this plan.)

Known as the Value Analysis Job Plan, this six-step formula details the approach covered not only in the course but also in actual practice:

I. BECOME INFORMED: Learn all the details of the project—costs, vendors, drawings and specifications, quantities used, materials specified, etc. Talk with experts who are familiar with the project, so that you understand it thoroughly.

II. SPECULATE: Think creatively. Search for all solutions to the problems you have. Explore every avenue that might lead to a possible solution. Get all these suggestions down on paper.

III. ANALYZE: Study all the suggestions carefully and pick out the most promising ones, from the standpoint of reliability and cost. Write off to vendors for quotations. Check on methods of manufacture. Consider design changes.

IV. PLAN: Consult with engineers and vendors, who will be able to offer valuable advice on materials, design, and manufacturing techniques. Keep working until you are able to arrive at tangible conclusions.

V. EXECUTE: Get your conclusions into orderly form. Consult with other project teams, to make certain that your conclusions don't jeopardize theirs. Put your conclusions in writing, spelling out all the essential details.

VI. ACT: Present your conclusions to the developer and manufacturer of the product, so that he can take prompt action to build optimum value into the product.

Once the job plan has been established, work on the project begins in earnest. Teams, working separately and together, follow the formula until the project is concluded. Work

How does the value analyst proceed with a project?

VALUE ANALYSIS JOB PLAN

1. Information Phase

a. Secure all pertinent facts—actual samples of parts and assembly where practicable. Costs, quantities, vendors, drawings, specifications, planning cards and manufacturing methods information.
b. Learn the basic engineering, with the engineer, ask questions, listen, develop with him a thorough understanding of the product.
c. Learn the basic manufacturing—observe manufacturing, ask questions, listen, study.
d. Decide the amount of effort that should reasonably be expended on each item of cost.

2. Speculative Phase

a. Generate every possible solution to the problem.
b. Consult others who may help you.
c. Systematically explore various materials, machine processes, rearrangement of parts, etc.
d. Encourage free use of the imagination.
e. Record every suggestion that seems remotely possible.
f. Establish two-man teams for creation of additional ideas.

3. Analytical Phase

a. Estimate the dollar value of each idea.
b. Develop all ideas with emphasis placed in proportion to their value and probability of accomplishment.
c. Investigate those ideas with an "obvious" reason why "it won't work." List the good points and the bad points. Eliminate or overcome the objections.
d. Set up a program to vigorously pursue ideas with most promise.

4. Program Planning Phase

a. Break the job down into a progression of functional areas; i.e., a fastening job, an electrical contact job, a support job, a dust protection job, etc.
b. Select the top specialist in the General Electric Company to consult on each.
c. Select from one to three of the best suppliers in the country for each functional area of the product.

5. Program Execution Phase

a. Point out the top function desired—discuss the problems and solicit specific suggestions with both in-company and out-of-company specialists.
b. Constantly pursue thoroughly and intensely until suggestions of all specialists are in. Work with vendor companies until they can provide alternate practical suggestions and quotations.
c. Periodically support the work of the specialists by speculative or idea study and evaluation pertaining to the individual functional areas.
d. Stick to each promising suggestion. Thrash it out and reach definite tangible, usable conclusion.

6. Status Summary and Conclusion

a. Issue a concise suggestion sheet covering each part which shows possibilities.
b. Make certain the sheet shows pertinent information, such as . . .
   . . . before and after sketch of the part.
   . . . quantities used per year.
   . . . material, labor, and shop cost.
   . . . suggested cost, and tool cost, if any.
   . . . statement describing function of part.
   . . . suggestions in condensed form.
c. Send copies to the man designated by the manager to receive and follow up, also to others who should receive them.
d. Send all quotations to the Purchasing group concerned. Attach all specific engineering data, engineering studies, etc. to one copy and all studies pertinent to manufacturing methods, techniques, etc. to another of the copies given to the designated follow-up man.
e. Finish the job promptly and go on to the next.

is intense, relieved only by a one-week break at the halfway mark. Dividing the ten-day-long seminar at midpoint accomplishes two things: The participant does not have to stay away from his own plant for more than a week, and the extra time allows vendors time for adaptation of their products to the special functions required and insures that their quotations will arrive in adequate time. And there is one important by-product: During the off week, the trainee can use his leisure time to think about the project, to plan in greater detail for what he must do when the seminar reconvenes on the following Monday.

Speculating

How does a team member "speculate" about a component? The seminar instructors, drawing from past experience, are able to suggest a variety of ways in which the participant can approach this phase of the VA Job Plan:

(1) What does the part now cost? What percentage of the motor's total cost is this? What are material costs of the part? Labor costs? Overhead costs? Machining costs? How does each of these costs affect all the other costs?

(2) Is the part really necessary? Does it have a vital function in the motor? In a surprising number of projects, great savings have resulted simply from elimination of certain components.

(Here the teams are urged to proceed with caution. If a part is eliminated, the redesigned product still must have the same quality as or better quality than the original. There are many parts that can be removed entirely, but their elimination must *never* remove quality, no matter how much costs drop. Actually, the functions of many parts may be transferred to other parts and assemblies. Too, in many cases the needs of customers and requirements of the job have changed since the products were designed, so that some parts no longer make *any* contribution to the use or features wanted by the customers. One point the VA staff likes to emphasize: Taking off features that the customer might like, but which he can probably "get by without," violates the basic principles of Value Analysis.)

(3) Is the part too complex? Often the design can be simplified, reducing the cost of manufacture and improving reliability.

(4) Can the part be made by another process? Here a simple forming operation on a press may be able to replace an expensive screw-machine or milling operation. Or a forging may replace a casting. Or a stamping process may eliminate expensive fabrication.

(5) Can the part be made by a specialty vendor? Value Analysis lays great stress on the services of these suppliers, who with their specialized facilities are often able to supply components at far less cost than company-made parts. Too, their experience with specialty components makes their advice extremely useful.

(6) Can the plant make the part more cheaply than an outside supplier? Often changes in design or manufacturing will enable the plant to use its own facilities more profitably than it was able to do in the past; as a result, expensive services of an outside specialist are no longer needed.

(7) Can a less expensive material be used? Often a new material will be as reliable as, yet cheaper than, the material specified in the design. Chances are that the responsible design and engineering people specify materials that have been successful in the past, and that they aren't aware of the newly developed material.

(8) Can a custom-built part be replaced by a standard part? The VA group has found that in many cases components available as standard fittings will do just as good a job as

new materials NEWS

ISSUED BY VALUE ANALYSIS SERVICE
MATERIALS SERVICE
Schenectady, New York

August 1958

METALS AND METAL PRODUCTS

Thermoclay Strip

Electroplating plus heat treatment changes chemical bond into a metallurgical bond. Thus terminals and other parts blanked from Thermoclay strip (all tempers available) are vastly superior to barrel plated brass parts and at a fraction of cost of conventional silver-clad brass. Many other combinations are available. Electroplated layers include choice of silver, copper, tin, nickel on one or both sides. Base metals include copper, brass, nickel, low carbon steel, nickel silver, Kovar, monel and others.
(American Silver Company, Inc., 36-07 Prince Street, Flushing 54, New York)

Extruded Tubular Rivets

These rivets are headed and the hole extruded complete in one operation on high speed headers. The most important advantages are...uniformity in hole location and wall thickness. The sidewalls are stronger than drilled rivets due to finer grain structure. Because of an independent price policy, General Electric has the potential of very substantial savings.
(New Jersey Rivet Co., 10 S. 3rd Street, Camden 3, New Jersey)

PLASTICS

Resinous Products for Reinforced Plastic Applications

A series of new resinous products for reinforced plastic applications, designed to withstand operating temperatures up to 500°F is announced. The resins provide the combination of the ease of handling of polyesters, high temperature resistance approaching phenolics, and desired electrical characteristics. They are suggested for applications undergoing continuous exposure at 425°F or intermittent exposure at 500°F. The inherent temperature resistance and chemical resistance of the new products, coupled with their ability to provide

GENERAL ELECTRIC

News about new materials . . .
is of great importance to the Value Analysis program. At frequent intervals, Value Analysis Services sends out multi-page notices of new developments in materials to all interested GE personnel

Special bulletins . . .
on important new developments go to every GE plant. The reverse side of this sheet gives extensive technical data on the development, so that designers, buyers, and manufacturing men can compare it with similar developments

expensive special components. Usually, only minor changes in the specifications of these mass-produced parts are needed.

(9) Can the part be made by a new process? The VA staff at GE endeavors to constantly keep abreast of new manufacturing processes: automatic assembly, powder metallurgy, new casting methods, ultrasonic cleaning and finishing techniques, machinability developments, and all other new developments that might reliably produce the component less expensively. Naturally, the Value Specialist cannot master *all* new developments; but he can and must be aware of all new technologies, and must be prepared to call in experts in these fields at the proper time in product development or re-planning cycles.

(10) Can some steps in the manufacturing process be simplified or eliminated? Some parts are "overmade." A finishing operation, for example, may not add "appearance value" if a part is permanently concealed. Or the tolerances held on a part may be much too fine for the job that the part actually performs. Or a new machining technique may simplify the process eliminating some production operations.

These questions, which each team in the seminar must investigate, by no means exhaust the repertory of Value Analysis techniques. But they are representative of the approach that the seminar takes. And this extensive search— this digging for results—almost always pays off handsomely.

Analyzing the Project

Phase III of the VA Job Plan consists of analyzing all the suggestions developed in Phase II, then selecting the most promising for more concentrated planning. Here selectivity is important: All impractical ideas are carefully weeded out, and the trainee makes every effort to secure all possible data on the remaining suggestions—the ideas that he will develop into practical recommendations at the end of the seminar. Emphasis here is on selecting the alternatives that offer greatest benefits, then concentrating on ways to overcome any shortcomings they may have.

At this point, the trainee is urged to write off for quotations from suppliers of materials and components. Normally, he sends these requests by mail, but he can telephone the vendor if it looks as if he'll have trouble meeting his deadline. He can send off as many requests as he likes; there are no restrictions in this respect.

Meanwhile, each team carefully checks the design and manufacturing techniques that go into the making of the component assigned to it. The team consults experts in these fields; investigates new processes for machining, fabrication, and assembly; checks with purchasing agents; and gathers all the necessary data for setting the machinery of the program into motion. And because teamwork is essential, there are frequent comparisons of notes with other teams that are working on the project.

Planning the Proposals

When Phase IV of the Job Plan is reached, early in the second week, the project has shifted into high gear. By now, quotations from vendors are beginning to come in. Each team is thoroughly familiar with the way its component is made, as well as a host of alternative methods of manufacturing. And all participants in the seminar are thoroughly indoctrinated in every aspect of material and fabrication costs.

Innovations in training don't stop here. Specialty vendors, selected by the VA staff because their products apply to the project, come into the classroom to demonstrate what they have to offer. (At one recent seminar, more than 50 vendors responded to GE's invitation.) The range of

products shown is extensive: A maker of industrial fasteners shows how his products can be used in the project; a supplier of epoxy resins will give an actual demonstration; another vendor will exhibit newly developed insulating material; still another vendor shows off a new welding or cutting technique.

There are further talks by experts who are familiar with the project: manufacturing men, designers, purchasing agents, and research and development engineers. And basic talks on every conceivable aspect of Value Analysis continue to be given in generous doses.

Meanwhile, concentrated work on the project draws to a close. Teams are urged to get their proposals down on paper. The process of selectivity continues, and concrete, workable ideas begin to emerge from the apparently chaotic data that has been studied so exhaustively during the past few days.

The Final Phases

Just before the end of the seminar, teams are asked to summarize their findings and to make specific recommendations that, adopted by the company, will result in a product that has greater "value" than the original. By now all suggestions have been thoroughly analyzed, sifted through, and put into presentable form. The proposals of all teams have been coordinated, and at last the recommendations are ready for presentation.

At the end of the seminar, representatives from the plant which makes the product that has been analyzed are invited to visit the class. Here the proposals of the class are formally presented to them for action. The VA group at General Electric emphasizes this point: The proposals are presented as recommendations, not commands. The plant has the right to act upon the proposals or to ignore them.

There is one further point which the VA staff likes to make: Its proposals do not necessarily represent the ultimate in value improvement. The plant receiving the recommendations should be able to extract even more value out of them. If the men who make the product (and who therefore are most familiar with it) can't make still further improvements, there is something wrong somewhere!

What sort of recommendations come out of the seminar? The example selected to illustrate the story here is a hypothetical one, and for this reason it is impossible to cite specific proposals. But an examination of hundreds of proposals made on other projects leads one to believe that the following recommendations would be typical:

- For the present insulating material, substitute the ABC Company's product. A newly developed material, it has better insulating properties than the original and costs 30% less.
- Redesign the end shield, which is unnecessarily bulky and requires expensive spot welding of the screen to the frame. Substitute a perforated metal stamping. Cost reduction here will be 70%.
- Simplify the wiring in the conduit box, as shown on the proposal sheet. Savings: 20% over the original.
- Total yearly savings: $55,000.

Value Analysis and Teamwork

As this article shows, Value Analysis has come a long way since it was established at General Electric twelve years ago. By acting as a monitor of all GE product activity, it has helped greatly to integrate the company's widely diversified interests. And it is this contribution to company-wide teamwork that is perhaps the greatest achievement of Value Analysis.

To be completely successful any management program must be contagious. And the Value Analysis staff does not operate in a vacuum. The ideas of Value Analysis men, and the recommendations they make, are effective stimuli for engineers, manufacturing men, and buyers in their own work. The techniques of Value Analysis, used by these people, bring into focus additional viewpoints, additional information, additional possibilites. At the same time that they accomplish their normal objectives, VA techniques enable them to build a higher degree of value into their products.

The importance of teamwork was apparent to the Value Analysis staff from the beginning. No further proof of this is needed than to reprint a portion of L D Miles' introduction to his AMERICAN MACHINIST article of July 1949:

"Value Analysis represents an important concept in modern industrial management. Through Value Analysis, management makes Purchasing a full-time partner in cost reduction, and thus taps a reservoir of skill and knowledge that brings enrichment of value to all General Electric products. In Engineering, Value Analysis brings a new outlook to component parts design. It stimulates the cost-consciousness of every engineer to make certain that new designs include the latest advances in low-cost production techniques. For Manufacturing, to supplement the constant efforts of methods men and planners, Value Analysis represents a valuable new tool, extending the range of those responsible for dollar production and bringing their problems directly into the shops of suppliers. To any group in the company, Value Analysis offers a basic approach to greater value through principles and procedures universally applicable and readily understood.

"Its success in General Electric is due not only to its basic soundness but to a large degree to the enthusiastic support of management at all levels in Purchasing, Engineering, and Manufacturing."

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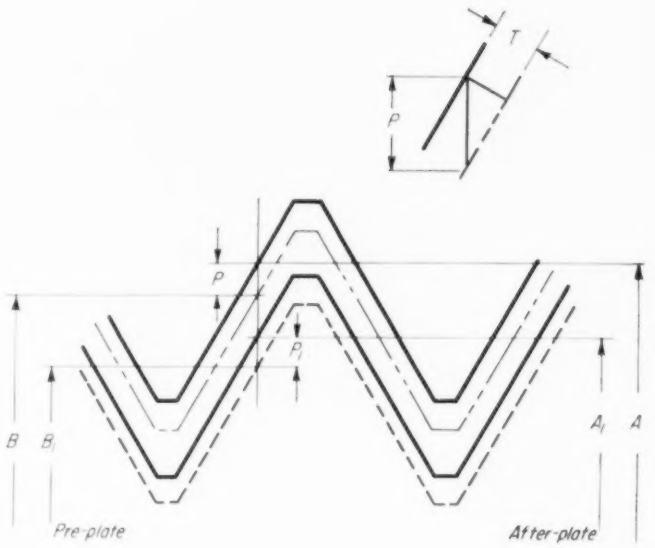
REFERENCE BOOK SHEET

Thread Limits Before Plating – I

By P L Cardinal, tools and methods specialist,
Heavy Military Electronics Dept, General Electric Co, Syracuse, N Y

Threading and gaging of male and female parts are common metalworking operations. How the thread is generated or gaged usually presents no major problem, so long as it is adaptable to the assembly in which it is used. If the threaded part of fastener outlives its usefulness, it is simply an annoying replacement task. Very little concern is given to quality, durability or workmanship of the fastener, so long as it holds a part in its proper place.

When new, intricate designs and assemblies must be built, as by the Heavy Military Electronics Dept, it may be found that threaded parts or fasteners are much more vital parts than is commonly supposed. Malfunction of an electronics assembly, attributed to a threaded part or fastener, involves a costly and tedious replacement procedure. The cause might be traced to poor workmanship, inadequate manufacturing and gaging equipment, or corrosion.



To Improve Quality

Our department determined to do something about this situation. We decided that we must improve the quality of our threaded parts by (1) depositing a pre-determined amount of plating on metal parts subject to corrosion by exposure and (2) applying a decorative finish on threaded parts when required.

To deposit a predetermined amount of plating on a threaded part, it is essential to control the pitch diameter and quality of these parts *prior* to plating. The reason for this is the fact that the plating thickness on a thread affects the pitch diameter by a 4:1 ratio. Example: a plate thickness of 0.0005 when multiplied by 4 affects the pitch diameter by 0.002 in. See illustration. To accomplish these controls, we procured and/or developed the equipment needed to manufacture and gage these parts.

The National Bureau of Standards has established an interference allowance for threaded parts (Class 2A & 2B). It is Bureau's opinion that this is an adequate allowance for plating threaded parts. If we are considering a flash plate for decorative threads, this conclusion might be true. It has been our experience that where the deposit of plate exceeds .0002 in. on the flank and must withstand exposure, these recommended allowances are inadequate.

The threading and gaging practices, as developed in the Heavy Military Electronics Dept, are, in our belief, a long stride toward producing plated threaded parts that will conform to all threading standards.

Generating Male Threads

For threading Class 2A male parts prior to plating, single-point tools, thread chasers and thread-rolling equipment are recommended. These tools can be ad-

(text continued on p139)

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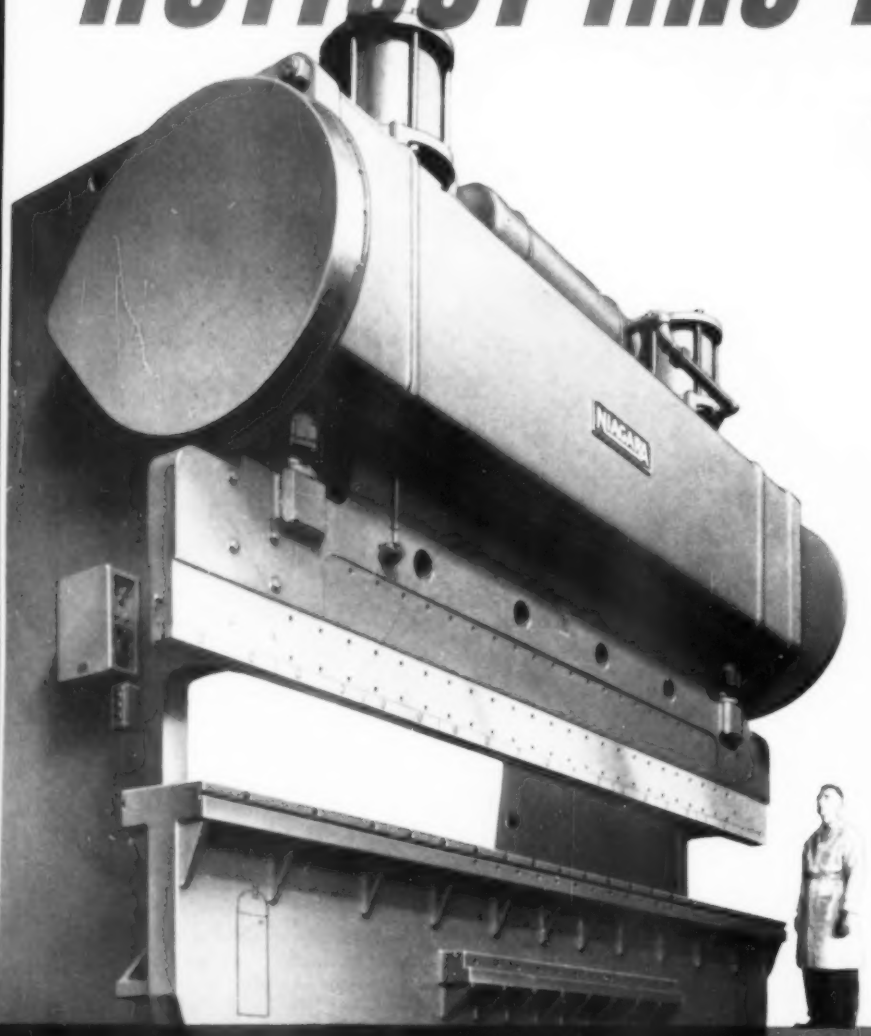

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Thread Limits Before Plating – II

Thread Data		External Threads								Internal Threads		
		Deposit Thickness 0.0002 to 0.0003 In.				Deposit Thickness 0.0005 to 0.0007 In.				Deposit Thickness (see text, p139)		
		Gage Settings Minus from Basic PD				Gage Settings Minus from Basic PD				Gage Settings Plus from Basic PD*		
		Before Plating		After Plating		Before Plating		After Plating		Before Plating		After Plating
Size	No. of Thrds and Class	High Limit	Low Limit	High Limit	Low Limit	High Limit	Low Limit	High Limit	Low Limit	High Limit	Low Limit	High Limit
0	80-UNF-2A	−0.0015	−0.0033	−0.0005	−0.0023	−0.0030	−0.0048	−0.0005	−0.0023			
1	64-UNC-2A	−0.0016	−0.0036	−0.0006	−0.0026	−0.0031	−0.0051	−0.0006	−0.0026			
1	72-UNF-2A	−0.0016	−0.0035	−0.0006	−0.0025	−0.0031	−0.0050	−0.0006	−0.0025			
2	56-UNC-2A	−0.0016	−0.0037	−0.0006	−0.0027	−0.0031	−0.0052	−0.0006	−0.0027			
2	64-UNF-2A	−0.0016	−0.0036	−0.0006	−0.0026	−0.0031	−0.0051	−0.0006	−0.0026			
3	48-UNC-2A	−0.0017	−0.0040	−0.0007	−0.0030	−0.0032	−0.0055	−0.0007	−0.0030			
3	56-UNF-2A	−0.0017	−0.0039	−0.0007	−0.0029	−0.0032	−0.0054	−0.0007	−0.0029			
4	40-UNC-2A	−0.0018	−0.0043	−0.0008	−0.0033	−0.0033	−0.0058	−0.0008	−0.0033	+0.0033	+0.0015	+0.0033
4	48-UNF-2A	−0.0017	−0.0041	−0.0007	−0.0031	−0.0032	−0.0056	−0.0007	−0.0031	+0.0031	+0.0015	+0.0031
5	40-UNC-2A	−0.0018	−0.0044	−0.0008	−0.0034	−0.0033	−0.0059	−0.0008	−0.0034	+0.0033	+0.0015	+0.0033
5	44-UNF-2A	−0.0017	−0.0042	−0.0007	−0.0032	−0.0032	−0.0057	−0.0007	−0.0032	+0.0032	+0.0015	+0.0032
6	32-UNC-2A	−0.0018	−0.0046	−0.0008	−0.0036	−0.0033	−0.0061	−0.0008	−0.0036	+0.0037	+0.0015	+0.0037
6	40-UNF-2A	−0.0018	−0.0044	−0.0008	−0.0034	−0.0033	−0.0059	−0.0008	−0.0034	+0.0034	+0.0015	+0.0034
8	32-UNC-2A	−0.0019	−0.0048	−0.0009	−0.0038	−0.0034	−0.0063	−0.0009	−0.0038	+0.0038	+0.0020	+0.0038
8	36-UNF-2A	−0.0018	−0.0046	−0.0008	−0.0036	−0.0033	−0.0061	−0.0008	−0.0036	+0.0036	+0.0020	+0.0036
10	24-UNC-2A	−0.0020	−0.0053	−0.0010	−0.0043	−0.0035	−0.0068	−0.0010	−0.0043	+0.0043	+0.0020	+0.0043
10	32-UNF-2A	−0.0019	−0.0049	−0.0009	−0.0039	−0.0034	−0.0064	−0.0009	−0.0039	+0.0038	+0.0020	+0.0038
12	24-UNF-2A	−0.0020	−0.0054	−0.0010	−0.0044	−0.0035	−0.0069	−0.0010	−0.0044	+0.0044	+0.0020	+0.0044
12	28-UNF-2A	−0.0020	−0.0052	−0.0010	−0.0042	−0.0035	−0.0067	−0.0010	−0.0042	+0.0042	+0.0020	+0.0042
1/4	20-UNC-2A	−0.0021	−0.0058	−0.0011	−0.0048	−0.0036	−0.0073	−0.0011	−0.0048	+0.0048	+0.0020	+0.0048
1/4	28-UNF-2A	−0.0020	−0.0053	−0.0010	−0.0043	−0.0035	−0.0068	−0.0010	−0.0043	+0.0043	+0.0020	+0.0043
5/16	18-UNC-2A	−0.0022	−0.0062	−0.0012	−0.0052	−0.0037	−0.0077	−0.0012	−0.0052	+0.0053	+0.0020	+0.0053
5/16	24-UNF-2A	−0.0021	−0.0058	−0.0011	−0.0048	−0.0036	−0.0073	−0.0011	−0.0048	+0.0048	+0.0020	+0.0048
3/8	16-UNC-2A	−0.0023	−0.0067	−0.0013	−0.0057	−0.0038	−0.0082	−0.0013	−0.0057	+0.0057	+0.0020	+0.0057
3/8	24-UNF-2A	−0.0021	−0.0059	−0.0011	−0.0049	−0.0036	−0.0074	−0.0011	−0.0049	+0.0049	+0.0020	+0.0049
7/16	14-UNC-2A	−0.0024	−0.0071	−0.0014	−0.0061	−0.0039	−0.0086	−0.0014	−0.0061	+0.0061	+0.0020	+0.0061
7/16	20-UNF-2A	−0.0023	−0.0065	−0.0013	−0.0055	−0.0038	−0.0080	−0.0013	−0.0055	+0.0054	+0.0020	+0.0054
1/2	13-UNC-2A	−0.0025	−0.0075	−0.0015	−0.0065	−0.0040	−0.0090	−0.0015	−0.0065	+0.0065	+0.0020	+0.0065
1/2	20-UNF-2A	−0.0023	−0.0066	−0.0013	−0.0056	−0.0038	−0.0081	−0.0013	−0.0056	+0.0056	+0.0020	+0.0056
9/16	12-UNC-2A	−0.0026	−0.0078	−0.0016	−0.0068	−0.0041	−0.0093	−0.0016	−0.0068	+0.0068	+0.0025	+0.0068
9/16	18-UNF-2A	−0.0024	−0.0069	−0.0014	−0.0059	−0.0039	−0.0084	−0.0014	−0.0059	+0.0059	+0.0025	+0.0059
5/8	11-UNC-2A	−0.0026	−0.0081	−0.0016	−0.0071	−0.0041	−0.0096	−0.0016	−0.0071	+0.0072	+0.0025	+0.0072
5/8	18-UNF-2A	−0.0024	−0.0071	−0.0014	−0.0061	−0.0039	−0.0086	−0.0014	−0.0061	+0.0060	+0.0025	+0.0060
3/4	10-UNC-2A	−0.0028	−0.0087	−0.0018	−0.0077	−0.0043	−0.0102	−0.0018	−0.0077	+0.0077	+0.0030	+0.0077
3/4	16-UNF-2A	−0.0025	−0.0075	−0.0015	−0.0065	−0.0040	−0.0090	−0.0015	−0.0065	+0.0065	+0.0030	+0.0065
7/8	9-UNC-2A	−0.0029	−0.0092	−0.0019	−0.0082	−0.0044	−0.0107	−0.0019	−0.0082	+0.0082	+0.0030	+0.0082
7/8	14-UNF-2A	−0.0026	−0.0080	−0.0016	−0.0070	−0.0041	−0.0095	−0.0016	−0.0070	+0.0070	+0.0030	+0.0070
1	8-UNC-2A	−0.0030	−0.0098	−0.0020	−0.0088	−0.0045	−0.0113	−0.0020	−0.0088	+0.0088	+0.0030	+0.0088
1	12-UNF-2A	−0.0028	−0.0087	−0.0018	−0.0077	−0.0043	−0.0102	−0.0018	−0.0077	+0.0076	+0.0030	+0.0076
1 1/8	7-UNC-2A	−0.0032	−0.0104	−0.0022	−0.0094	−0.0047	−0.0119	−0.0022	−0.0094	+0.0094	+0.0030	+0.0094
1 1/8	12-UNF-2A	−0.0028	−0.0088	−0.0018	−0.0078	−0.0043	−0.0103	−0.0018	−0.0078	+0.0078	+0.0030	+0.0078
1 1/4	7-UNC-2A	−0.0032	−0.0106	−0.0022	−0.0096	−0.0047	−0.0121	−0.0022	−0.0096	+0.0096	+0.0030	+0.0096
1 1/4	12-UNF-2A	−0.0028	−0.0090	−0.0018	−0.0080	−0.0043	−0.0105	−0.0018	−0.0080	+0.0080	+0.0030	+0.0080
1 3/8	6-UNC-2A	−0.0034	−0.0114	−0.0024	−0.0104	−0.0049	−0.0129	−0.0024	−0.0104	+0.0104	+0.0030	+0.0104
1 3/8	12-UNF-2A	−0.0029	−0.0092	−0.0019	−0.0082	−0.0044	−0.0107	−0.0019	−0.0082	+0.0082	+0.0030	+0.0082
1 1/2	6-UNC-2A	−0.0034	−0.0115	−0.0024	−0.0105	−0.0049	−0.0130	−0.0024	−0.0105	+0.0105	+0.0030	+0.0105
1 1/2	12-UNF-2A	−0.0029	−0.0094	−0.0019	−0.0083	−0.0044	−0.0109	−0.0019	−0.0083	+0.0083	+0.0030	+0.0083

* Low limit after plating = 0.0000

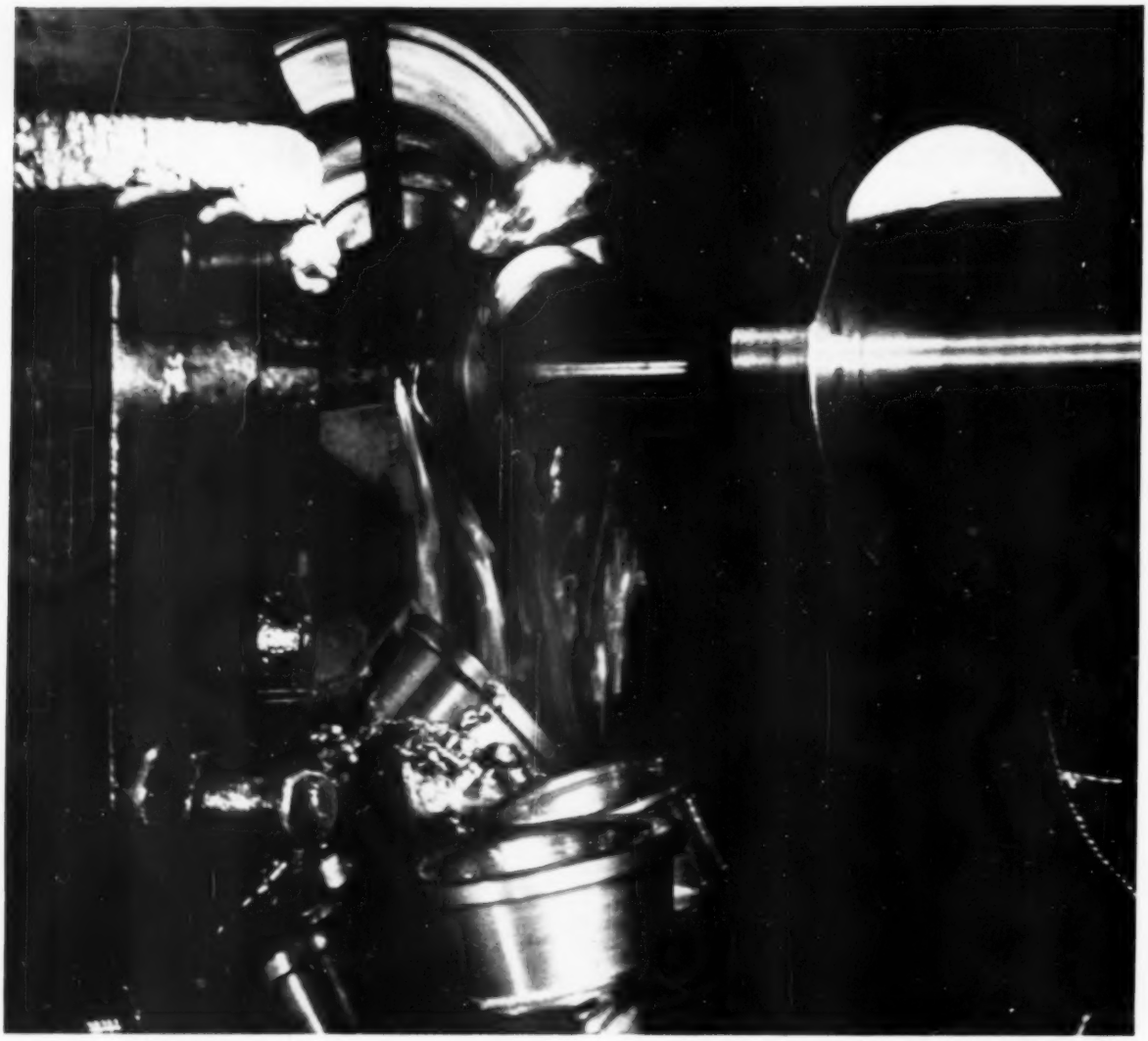

Photo courtesy of TYSON BEARING COMPANY, Division of SKF Industries, Inc.

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Thread Limits Before Plating – III

justed for the size reduction required for plating. Rolled threads are used when the finish required for plating cannot be produced by other conventional methods. These rolled threads produce a fine smooth finish on all non-ferrous materials.

Male parts requiring plating must have an allowance on the pitch diameter to compensate for the added material. To arrive at this allowance, we subtract the plating allowance, interference allowance and the tolerance from the basic pitch diameter. By doing so, we arrive at maximum and minimum of stock removal from basic pitch diameter prior to plating.

EXAMPLE: What are the minimum and maximum limits for stock removal from the basic pitch diameter, before plating, for $\frac{1}{4}$-20 UNC external thread? The thread data are:

Basic pitch diameter = 0.2175 in.
Max. PD = 0.2164 in.
Interference allowance = 0.2175 – 0.2164 = 0.0011 in.
Min. PD = 0.2127
PD tolerance = 0.2164 – 0.2127 = 0.0037 in.
T = plating thickness, 0.0002-0.0003 in.
See illustration:
P = effect on pitch diameter measurements by plating = T/sin 30° = 2T
A = max. PD of plated screw thread
A_1 = min. PD of plated screw thread
B = max. preplated PD = $A - 2P = A - 4T$
B_1 = min. preplated PD = $A_1 - 2P_1 = A_1 - 4T$

Now $4T$ = 0.0008 to 0.0012 for the example cited, but will be averaged at 0.001 in.

Obviously, the high limit prior to plating is therefore the interference allowance plus 0.001 = 0.0011 + 0.001 = – 0.0021 in., as given in the table on page 137. The low limit equals the interference allowance plus the tolerance plus 0.001 in. or 0.0011 + 0.0037 + 0.001 = – 0.0058 in. Stated another way, B = 0.2164 – $4T$ = 0.2164 – 0.001 = 0.2154, and thus the high limit is undersize from the basic pitch diamter by 0.2175 – 0.2154 = – 0.0021 in.

If the plating thickness is to be 0.0005 to 0.0007, we can assume $4T$ = 0.0025. Thus, the high limit is 0.0025 + 0.0011 in. allowance = – 0.0036 in. prior to plating, and the low limit = 0.0025 + 0.0011 + 0.0037 in. tolerance = – 0.0073 in. prior to plating.

To determine if the proper allowances have been made, prior to plating, adequate gaging equipment is needed. Direct-reading, thread-roll and snap-ring gages can be adjusted to determine the amount of material to be removed to compensate for the added plating thickness. They also check the part after plating to ascertain the proper deposit of plate and whether we are still within the standard limits allowed on the pitch diameter.

When gaging male pipe thread (taper) parts requiring plating, they are machined to the low tolerance of the thread ring gage.

Generating Female Threads

Wherever possible, all female threaded parts should be tapped using conventional cut taps. When blind-hole tapping is required in small holes (0 to $\frac{1}{4}$ in.) the use of "cold-forming" taps is recommended. These taps eliminate the chip problem that arises prior to plating.

Before plating female threads, it is essential that the tapped hole be sufficiently oversize on the pitch diameter to allow for plating. This can be accomplished by the fact that each threaded hole has an allowable maximum and minimum tolerance on the pitch diameter. By utilizing a tap that is approximately one-half this tolerance over basic pitch diameter, a tapped hole will be produced that is well within the maximum and minimum pitch diameter after plating. These taps can be purchased from all tap manufacturers who use the GH limit system to specify the pitch diameter of the tap.

In our operation, we are successfully using the following GH limit system for tapping. From 4-40 to and including 6-40, use GH 4 (basic + 0.0015 in. to basic + 0.002 in.); from 8-32 to and including $\frac{1}{2}$-20, use GH 5 (basic + 0.002 in. to basic + 0.0025 in.); from 9/16-12 to and including $\frac{5}{8}$-18, use GH 6 (basic + 0.0025 in. to basic + 0.003 in.); from $\frac{3}{4}$-10 to and including $1\frac{1}{2}$-12, use GH 8 (basic + 0.003 in. to basic + 0.004 in.). On all other sizes to determine the pitch diameter, we use one-half the pitch diameter tolerance.

When gaging female threads prior to plating, we use pivotal gages on sizes 4-40 to $\frac{1}{4}$ in. and thread comparators on all other sizes to 5 in. diameter. These gages allow us to control visually the amount over basic pitch diameter that is necessary to allow for plating.

Female pipe thread (taper) parts requiring plating are machined to the high tolerance of the plug thread gage.

The table on page 137 is used in the machine shop by operators and the Inspection Department. These data enable the operator to determine the amount of stock removal necessary on male and female threads, relative to the pitch diameter, to allow for plating. The Inspection Department uses these data to set up the gages to ascertain that the operator has maintained the correct pitch diameter prior to plating.

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Gun drilling has become an essential new machining technique for hundreds of firms. Jobs which otherwise would be done with great difficulty, or not done at all, are now handled on a fast-run production basis.

CLEVELAND Gun Drills have been responsible for important dollar savings by eliminating such operations as boring . . . honing . . . lapping . . . reaming . . . deep hole drilling which necessitates "peck feeding" . . . sequence of drilling, core drilling and reaming.

CLEVELAND Gun Drills can hold diameter tolerances within a few ten-thousandths of an inch—in one pass from a solid workpiece. Hole straightness of .002 inch maximum drift per foot is possible with a good set-up. In addition to eliminating secondary hole-sizing operations on many jobs, locating difficulties can be minimized.

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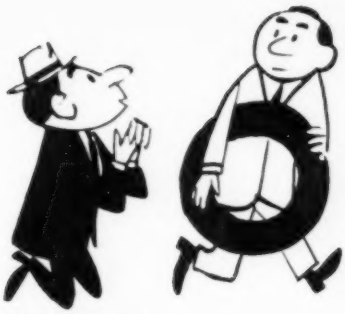
Talking Shop...



Mental Blocks

WHEN THE FAN BELT in a car breaks, the car must stop until a new belt can be brought and installed. When a fuel pump diaphragm breaks the same thing is true. Who carries a spare fan belt or fuel pump in his trunk? Nobody. With conventional tubeless tires the chance of using that spare tire in the trunk is about the same as the chance of using a spare battery. But who carries a spare tire? Everybody. When will the spare tire be eliminated? One auto engineer was recently guessing 1962 or 1963. It will take us as drivers that long to get adjusted to the idea of eliminating the "insurance policy" we buy when we pay for that fifth wheel.

Steam Job Shop

UNTIL RECENTLY the machines in the Howard Machine Shop in Blackville, SC, were powered by a steam engine. The same boiler had powered the shop from 1884 (only seven years after this magazine was founded) until early this year. William Howard started learning how to operate the machines from his father when he was only 8 and all the machine shops were powered by steam. William Howard never changed the engine. It doesn't surprise us that the shop finally closed down, but it makes us a little sad that we didn't hear about it until the fire had been pulled for the last time.

Production Rate

ON THE DAUPHINE lines at Renault (AM—May 4 '59, p 112) the efficiency rate has now reached 84%. Of the 16% of the time the line is down, three-fourths is predictable stops, made for tool changes (made on a regular schedule) and preventive maintenance. The remaining quarter is unpredictable, caused by electrical or mechanical breakdowns.

"Temporary" Taxes

WHEN HE WAS visiting the United States recently, P E Bézier of Renault made a penetrating comment on the often-heard wish that this or that temporary tax be removed. "In France," he said, "we have paid some temporary taxes now for more than 800 years."

We bow to a superior, but suspect the only reason the French outdistance us is that they've been at it longer.

Air Mail One Boat

AT THE RECENT AGMA meeting, John Buehler of Indiana Gear was telling us as novel a diversification story as we have ever heard. John read in a popular magazine about a novel boat driven by a hydraulic jet instead of a propeller that had been developed in New Zealand. Indiana Gear likes gears but has been seeking a chance to diversify and so John cabled "Please air mail one boat collect." Lots of people started trying to get the US rights to the idea but nobody else asked for a boat by air mail, so now Indiana Gear is building the most amazing little boat we've ever seen. It accelerates like a sports car and operates in little more water than you'll find on a wet lawn. Those glass fiber hulls must seem a little strange among the gears in the shop. As nearly as we can discover, there isn't a single gear in the jet boat except the ones that drive the camshaft engine.

MEMOS

by BESS RITTER

Back in 1904, when the violation of speeding laws by the motorist was just as much of an offense in America as it is today, the grand-daddy of today's speedometer was put on the market. The contrivance had no less than three dials. One faced the operator and indicated exactly how fast he was traveling. The remaining two dials faced the sides of his vehicle. These also indicated the current rate of speed, but in addition did this in color. Numbers showed up in black when the car was travelling at less than four miles an hour. The numbers changed to white when the car was doing ten. They changed again to green when the car was doing twenty. Then a brilliant red appeared when the operator was daringly going faster.

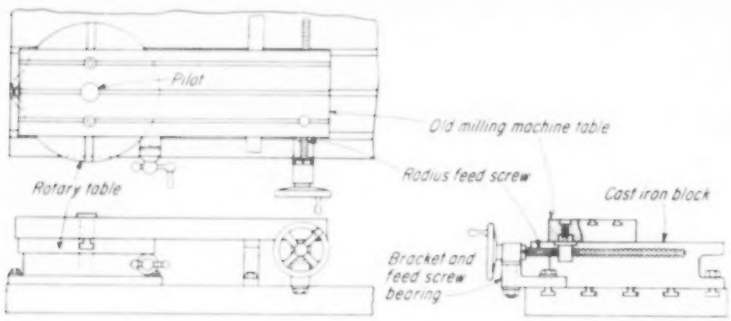
The dials were so plain, that, according to the manufacturer, his product could actually save much official embarrassment, as the color could be noted easily without stopping the motorists, which of course in the words of his own ad would, "save the operator expensive lawsuits."

When Athens was at the acme of its intellectual prowess, inanimate pieces of metal were put on trial in the town hall when these lifeless objects had inadvertently killed or maimed a human, and if these articles were, in due course, judged to be guilty, they were seriously punished. One popular penalty consisted of banishment, if the metal article was believed to have killed a human.

Plato seems to have approved of this "judging of the metals," because in his great work "The Laws," he says, "if any lifeless object . . . shall deprive a man of life either by falling on him, or through the man's falling on it," it shall be judged and "if found guilty, shall be cast beyond the boundaries."

Practical Ideas...

Rotary-Table Extension For Large Radii



We recently were required to mill a 27½-in. radius on a gravity die, and as we only had a 12-in. rotary table this seemed like a tall order. However, the difficulty was effectively overcome with the aid of a simple arrangement which increased the capacity of our 12-in. table to 30 in.

This is how we did it: We borrowed the work table from an old milling machine and bolted it to the rotary table, which was secured at one end of our working miller. The lead screw from the old machine was also put to use. Mounted on a bracket attached to the working miller table, it provided the necessary feed mechanism to swing the extension table in a radius.

Details of the feed can be seen at right in the sketch. The bracket carries a bearing stud which swivels with the motion of the radius feed as does a threaded spigot on the underside of the extension table. The sketch also shows a cast-iron block which is machined to the same height as the rotary table and is designed to support the overhanging extension.

A centering post, inserted into the center of the rotary table, engages a pilot hole in the extension table. Holes are drilled through the extension, on either side of the pilot hole, for bolting the two members together.

With the rotary table's worm screw disengaged, the work—clamped on the extension table—is fed into the cutter with the radius feed screw. Thus the rotary table provides stability as it serves as a pivot. Radius measurements are taken from the center of the rotary table's centering post.

R Andrews, director, Andrews & Hopkins Ltd, Kenilworth, England

How to Make Large Inexpensive Drills

In machining castings, large holes must often be drilled and bored. If, for some reason, standard drills cannot be used—like insufficient space between work and machine—or if the required size drill is not available, the pictured drills are good substitutes. These drills have many times saved us the expense of reducing a good standard drill to a stub drill.

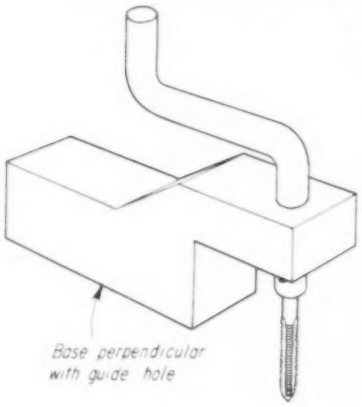
Drill rod is used as shanks and are cut to the lengths required for the job at hand. We have standardized on ½-in.-diameter shanks to eliminate changing collets when changing drils.

After both ends of the rod have been faced, a piece of tool bit (one from the scrap box will many times do) is brazed or silver soldered to one end. With the shank chucked in the tool grinder, the tool-bit ends are ground concentric with the shank to insure equal cutting action on both sides. For most work, the cutting lips are ground to a standard 59° included angle with moderate lip clearance.

We use these drills in diameters from ⅝ to 3 in. and as counterbores by varying the grind as shown.

To use, we first drill a ½-in.-diameter starting hole and follow with semi-spade drills of ¼ to ½ in. larger diameters until the desired size is reached. Using coolant will prolong drill life and produce a finer finish.

Norman Fried, Los Angeles, Calif



Tapping Aid Insures Perpendicularly Cut Threads

A considerable number of ¼-in.-thick aluminum plates had to be drilled and tapped. Because of the size of these plates, many holes could not be reached with the drillpress spindle for drilling or tapping and, therefore, had to be done by hand.

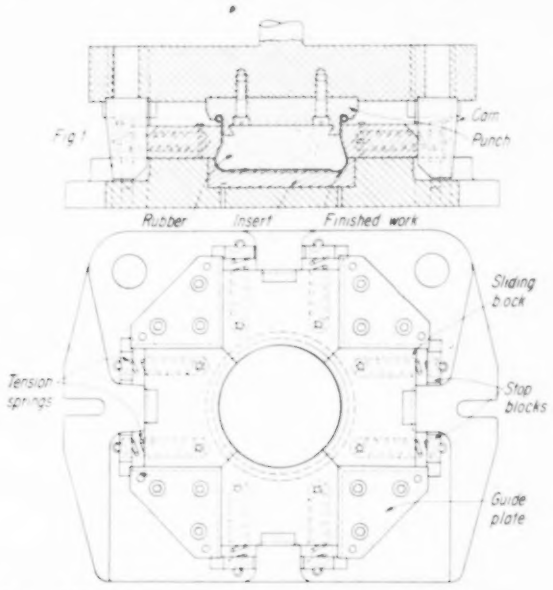
Drilling the holes was no problem. A portable-electric drill finished them in short order, but when time came to tap the holes, it wasn't so easy. The threads had to be cut perpendicular with the plate's surface, so the holes that couldn't be tapped in the drillpress had to be done by hand.

This was accomplished with the aid of the tapping guide shown. The operator would clear the plate of chips, place the base of the guide on the work, holding it with one hand while he used the other hand to turn the crank.

The base was machined as shown from 2 x 3 in. CR steel. To get a perfectly perpendicular guide hole, the base was strapped to the vertical miller table for drilling and reaming. A crank was then made up and drilled to receive the tap shank and a setscrew.

Jim Tesnow, Finlay, Ohio

Rubber-Nosed Punch Expands Cup and Curls Its Edge



Two additional operations were required to finish cup-shaped parts which had been blanked and drawn in the first stage of their production. Number one, their edge edge had to be curl finished; and number two, the diameter at the bottom had to be expanded.

Both these operations were easily performed simultaneously with the illustrated punch and die. A vertical projection of the punch at bottom dead center is shown in Fig. 1. Here it can be seen how a rubber-fitted curling punch also fills the cavity to expand the cup.

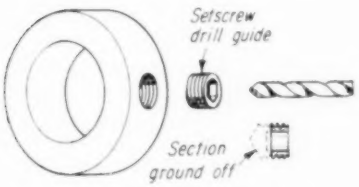
Four sliding blocks in the die, when closed, restrict the shape of the cup as well as simplify its evacuation when open. Thus, because of the retractibility of the rubber, no stripper is necessary to remove the part from the punch. And, because the sliding blocks are spring returned, ejectors are unnecessary, but may be incorporated to raise the forming-die insert to die-face level if desired. The two holes indicated under the insert can be used either as ejector holes or, if the insert is to remain stationary, as bolt holes.

After die has been manually loaded, each of four cams contacts respective sliding die blocks moving them into closed position. Though the forming-die insert, in a rough sense, also serves to center the work in loading, the sliding blocks firmly grip and locate the work as the punch enters.

Fabrication of the die is clearly illustrated. Each of the four sliding blocks operates between four corner blocks and is blind-hole drilled to accept tension springs which are anchored at the bottom of the holes. Two stop blocks, to which the other ends of the springs are attached, are mounted behind each sliding block.

The punch, in addition to its curling groove, is machined with a dove-tail recess to receive the rubber nose. This is made from rubber of medium elasticity, (approximately 60-70 durometer) and is machined, after freezing, to fit the recess in the punch. A good cement will keep the rubber in place.

Hjalmar Dahl, Upplands Vasby, Sweden



Shaft Spotting Simplified With Setscrew as Guide

When a stop collar, which is to be secured with a setscrew, must be accurately placed on a shaft, it is sometimes difficult to get a perfectly centered spot, or dimple, into the shaft. A center-punch mark is, for the most part, least accurate, and to use the tap drill to spot the shaft through the setscrew hole will often damage the thread in the collar or cause the collar to move from its intended location.

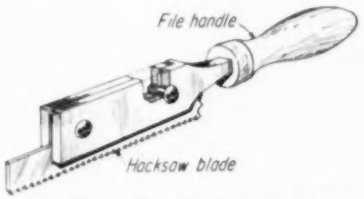
To safeguard against these risks, and at the same time provide a means of locking the collar in place, we use the socket end of the required-size setscrew. The cup or cone point end of the screw is ground away until the hexagonal socket shows through. This end is screwed into the setscrew hole of the collar and tightened against the shaft.

A perfectly centered spot can now be made in the shaft by a drill that will just pass through the setscrew socket. This spot can then be enlarged as required with the collar in place or slid to one side.

H F Spinks, Blackley, Manchester, England

Hacksaw-Blade Holder Serves as Utility Tool

Hack-saw blades are sometimes accidentally broken before they have reached the end of their usefulness. The cutting teeth are therefore often still capable of filling many cutting requirements, where it's possible to properly hold a section of the blade.



The illustrated holder is such a tool. Short lengths of saw blade can be held rigidly to make the unit an ever-handy utility tool. Maintenance men should find this tool just the thing for cutting back insulation between segments of an electric-motor commutator.

The holder is made from two pieces of flat steel, one of which is longer and fitted with a file handle. The shorter piece is milled to present a heel, of the same height as the thickness of the blade, along one edge. Two round-head machine screws, threaded into the heel piece, provide clamping force.

Federico Strasser, Santiago, Chile

Practical Ideas...

Frame Localizes Heat

For pin-point heat treatment of small parts we use this hollow CI frame. Its inside edge is drilled and tapped to receive a dozen nozzles; three from each of its four sides.

Fed by propane gas from a tank situated under the bench where heat treating is done, the nozzles direct the flame on the part held in a chuck mounting. Because this mounting is not attached to the bench, it, and the work it carries, may be moved to localize the heat at any desired point on the work.

A sheet-metal shield, erected in the back and around the sides of the frame, reduces fire hazards. The bench is also protected by a heat-insulated steel plate.

Harry J Miller, Sarasota, Fla

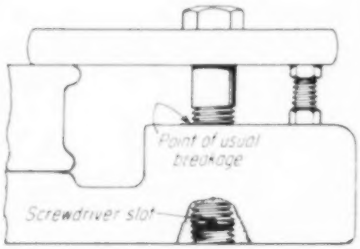
Lathe Chuck Adapted to Bench

This adaptation of a standard three-jaw chuck has been found useful for holding circular work on the machinist bench.

First, a hollow plug, which is a duplicate of the lathe-spindle nose on which the chuck is normally used, is welded to a steel-plate base over a centrally drilled hole. The plate is then secured by four bolts to a convenient spot on the bench where it will always be ready when needed.

When a hole of the same size as the one in the plate is drilled through the bench top, long work may be extended through the chuck and bench. During periods when this set-up is not in use, or when the chuck must be used in a lathe, the adapter should be protected with a cap.

H J Gerber, Stillwater, Okla



Screw-Driver Slot Aids Broken-Stud Removal

A large number of jigs and fixtures in our shop employ clamping of the type shown. The threaded members, either bolts or studs, are often subjected to excessive strain and, as a result, sometimes break. When this happens, the break is usually at or under the surface of the tool, making the broken-off piece difficult to remove.

We solved this problem by adding a screw-driver slot in the end of the threaded section of the bolt or stud and by tap drilling clear through the tool base. Now, when a break occurs, the piece left in the hole can be backed out from the bottom with a screw driver. This works equally well with studs broken off in T-nuts.

H Koslow, Bronx, N Y

Night-Light Extension Gets Into Tight Spots

The bulb and guard, on the average shop-extension cord, is sometimes too bulky to place in and around congested mechanical assemblies. When such areas must be inspected or worked on, we use a dime-store night light inserted in a plain electrical receptacle wired to a cord. This is small enough to be used almost anywhere, and the swiveling shade permits pin-pointing the light where needed.

E Mayorer, Bradenton, Fla

Benjamin Lechler
St. Louis, Missouri

WON

$25 In addition to regular payment for his idea:

INDICATOR EXTENSION SIMPLIFIES DEEP-BORE SETUPS

In the May 4, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers in asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

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WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

New Shop Equipment
Materials and Parts

Norton Adds Centerless Unit to Grinding Machine Line

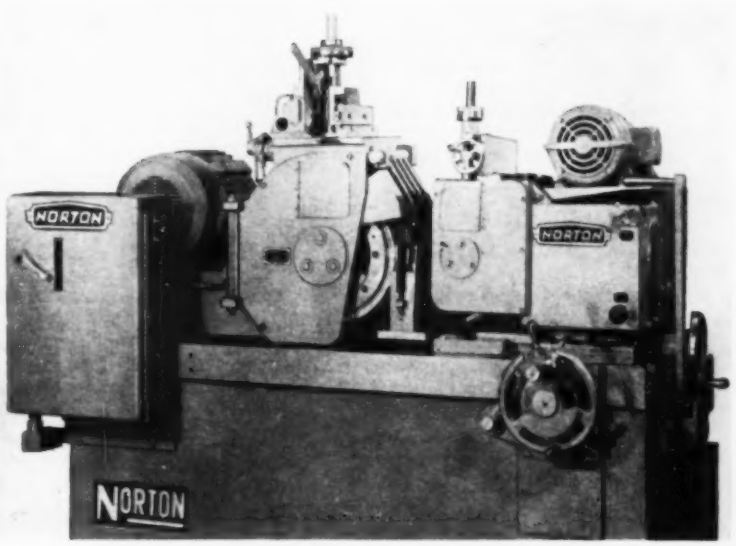
Norton No. 2 centerless grinding machine, the company's first entry in the centerless grinder field, features anti-friction "straddle bearings" which support the spindles on both sides of the grinding and regulating wheels. It can be equipped for fully automatic, semi-automatic or manual through-feed or plunge grinding. Work diameter capacity ranges from 1/16 to 4¾ in., depending on type of work rest and bar grinding fixture.

Straddle bearings minimize the tendency for the spindle to flex from the weight of the wheel and grinding pressure. Advantages include: more consistent sizing on through-feed operations; less truing required; better sizing, better straightness and contour control in plunge feed grinding; improved finish.

Mobile grinding head, with wheel mounted between head ways and feed screw located beneath wheel center for ideal balance, provides instant response to signal and results in fast sizing. Because the wheel is fed to the work, work loading arrangement is never disturbed by wear of either grinding or regulating wheel.

The grinding wheel head, with cast iron body, moves on hand-scraped ways of ample area to insure low unit pressure. This design is said to provide better vibration dampening than anti-friction ways and requires less wheel head and feed screw mass. The grinding wheel is fed to the work by a rotating feed screw engaging a large nut mounted on the bottom of the head. The driving motor is mounted on an adjustable plate with push-pull screw for belt tension adjustment. Grinding wheel truing is manually controlled and hydraulically powered in the standard version. With this unit, a 90° step in the wheel can be trued without any special equipment.

Regulating wheel speeds for grinding and truing are independent and quickly selected. The operator pulls out the knob to obtain the truing speed and pushes it back to obtain the preselected grinding speed. The work rest is mounted on the regulating wheel head base and swivels with the regulating wheel to eliminate extra adjustment when correcting for taper. Adjusting bolts and a calibrated scale are used to tilt the head, which is then held in place by a locking nut.



Wheel feeding or adjustment is made by a handwheel with a click-count index graduated to 50 millionths. In addition, the regulating wheel is adjustable longitudinally to accommodate various diameters as well as to compensate for wear. Regulating wheel head mounts a 12-in. dia wheel up to 8 in. wide. Speeds are infinitely variable from 8 to 66 rpm.

Base of the machine is a single piece of cast iron box construction for maximum rigidity.

Norton Co, Worcester 6, Mass

MORE DATA? Circle 51, inside back cover

Chrome Plating Process Increases Corrosion Resistance 500%

A new chrome plating process, called Duplex Chromium, applies a much thicker layer of chromium than ever before possible and increases corrosion and rust resistance up to 500%.

Because of internal stresses which built up rapidly within the coating and caused excessive cracking, it was not commercially possible to plate chromium much thicker than 10 to 20 millionths of an inch. The duplex process overcomes this difficulty by successive application of two different types of bright chrome plate.

The first coat consists of bright crack-free CF-520 chromium for especially good coverage and build-up in hard-to-reach recesses. The second coat is a bright deposit of finely cracked chromium from a specially operated CR-110 bath which builds up the total chromium thickness to as much as 100 to 200 millionths of an inch. The new process is adaptable to existing operations.

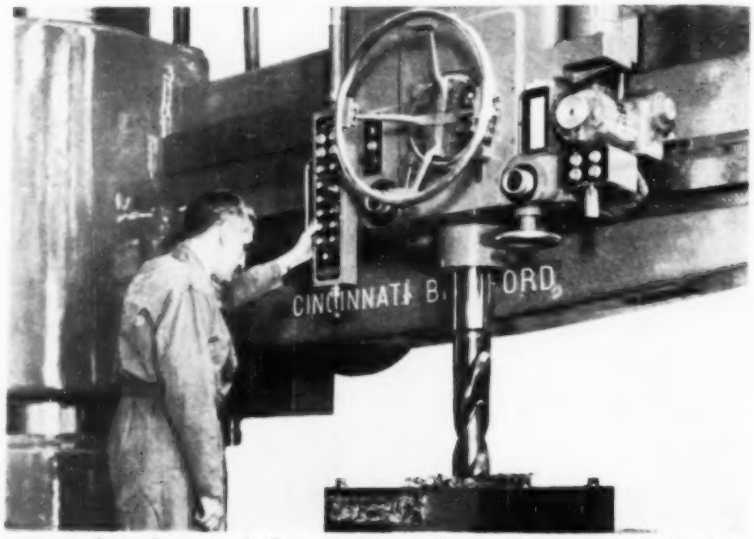
Metal and Thermit Corp, 1700 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 52, inside back cover

"Elephant" Radial Has 34-in. Column, 50-hp Motor

New 34-in.-dia column Cincinnati Bickford radial drill with 50-hp driving motor is reported to be the most powerful ever built. The first two of these machines have 10-ft arms, 9-ft clearance under the spindles, and weigh 40 tons each. They will be used for drilling and backfacing operations on turbine housings by General Electric's Large Steam Turbine-Generator Dept.

The standard Thrustmaster radials with 34-in. columns are available with 10, 12, or 14-ft arms, full pendant control, rapid traverse to spindle, power-assist for swinging the arm, and complete preselection of 32 speeds and 18 feeds. Speeds range from 6 to 875 and 9 to 1300 rpm (145:1 ratio). Feeds range from 0.004 to 0.125. Tap leads are 8-10-11½-14-20-27 tpi.



Spindle support is provided by seven angular-contact anti-friction bearings, preloaded for maximum rigidity. Diameter of the spindle is 3½ in and diameter of the sleeve is 6¾ in. Spindle travel is 28 in. The column sleeve is a high grade gray iron casting and the inner column is a steel forging. Preloaded bearings support the column and sleeve assembly at top and bottom.

Power for heavy drilling loads at slow speeds is transmitted smoothly to the spindle through a large herringbone driving gear. When high spindle speeds are desired, the herringbone gear is declutched and the drive is then through a spur gear.

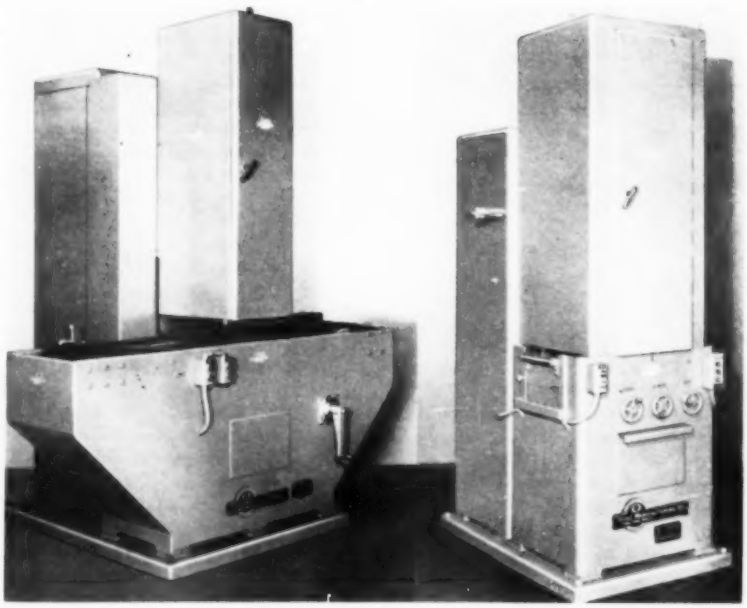
Cincinnati Bickford Div., Giddings and Lewis Machine Tool Co, 3220 Forrer, Cincinnati, Ohio

MORE DATA? Circle 54, inside back cover

Acme Introduces Abrasive Belt Finishing Machine Line

Line of Acme finishing machines performs abrasive belt grinding, polishing, and deburring on flat surfaces of bars, strips, castings, and similar work-pieces up to 15 in. wide and 8 in. thick. The machines, which can be used in tandem arrangements, are made in two models: the KC with conveyor belt feed, and the KP with pinch-roll feed.

Both machines feature pneumatic belt tension, positive manual or automatic belt tracking, micrometer grind pressure adjustment, V-belt drive for abrasive belt speed changes, infinitely variable control of speed of conveyor belt or pinch-roll feed, and easily changed contract rolls and conveyor belts. Both machines can be equipped for wet or dry polishing operations.



Model KC-8-in. (left) is a conveyor belt type for high production of parts with a variety of shapes. It has an 8-in. wide belt and can handle workpieces up to 8 in. thick. Belt speeds range from 3200 to 6400 fpm. Work feed ranges 15 to 60 fpm. The machine occupies a floor space of 74 x 50 in. and is 88 in. high.

Model KP-8-in. (right) is a pinch-roll type for high production of sheet coil or bar stock. It will finish square or rectangular tubing and extrusions up to 4 in. thick. The design provides a range from heavy stock removal to fine finishing. Belt speeds and work feeds are the same Model KC-8-in.

Acme Mfg Co, 1500 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 55, inside back cover

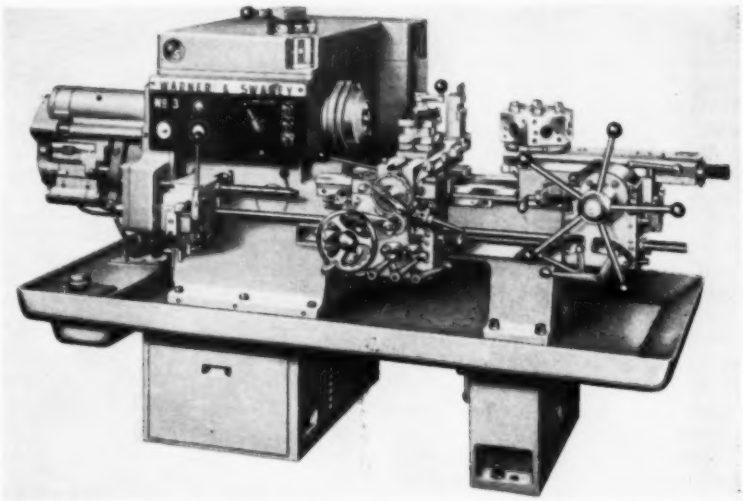
Warner & Swasey Has New No. 3 Universal Turret Lathe

Warner & Swasey's new No. 3 universal turret lathe, designed to handle bar work up to 1½-in. dia, features an eight-speed all-hydraulic clutch headstock and a single lever speed and preselection control.

The single lever control provides both spindle speed preselection and instantaneous speed changing in a one-hand operation. Its direct-reading preselector dial tells the operator the exact surface speed for each diameter and rpm, with numbered clips showing where to find each of the preselected speeds and in what order to use them.

The all-hydraulic headstock has a constant mesh, helical gear train which incorporates six hydraulic clutches for speed changing and braking the spindle. Headstock controls include a forward and reverse lever for changing the direction of motor rotation, plus high, low, and stop push buttons. It has an overall range of 25 to 1.

Power is supplied by a flange-mounted 10-hp reversible drive motor which provides eight spindle speeds, from 90 to 2262 rpm. An optional two-speed motor supplies 16 spindle speeds ranging from 45 to 2262 rpm.



A new hydraulic collet chuck and bar feed mechanism supply the extra support and rigidity needed for the high speeds and increased power. A control lever is used to open the collet and feed the bar up to 7 in.

Six reversible power feeds are provided for the universal cross slide, ranging from 0.0025 to 0.026 in. for cross feeds, and 0.003 to 0.030 in. for longitudinal feeds. The ram slide, with automatic indexing and locking hexagon turret, has six power feeds, from 0.003 to 0.030.

Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio

MORE DATA? Circle 56, inside back cover

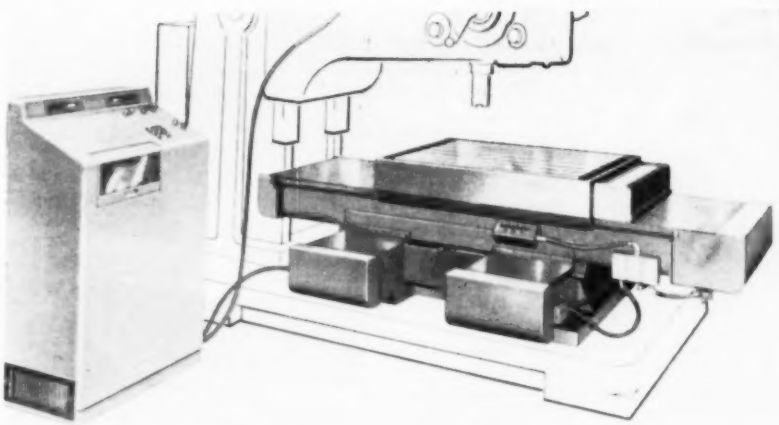
Positioning Table Claimed to Be World's Largest, Fastest

This numerically - controlled, two-axis, roller-mounted positioning table, made by Cincinnati Bickford, is said to be the largest and fastest in the world, at a price competitive with standard spacing tables. Control system was developed by Concord Control, Inc, of Boston.

The table, operated either by punched tape or a manual keyboard, is designed to position up to 5 tons of work for drilling, reaming, boring, tapping, or layout at speeds of 360 ipm. Accuracy is ±0.001 in., with repetitive accuracy to ±0.0005 in.

It measures 38 x 50 in., has a travel of 32 x 44 in., and an overall height of 26½ in. In spite of its high load capacity, the table can also be used for work as small as printed circuit boards.

Instructions can be punched into ⅞ or 1-in. tape on a standard preparation unit. Five-channel tape can also be used. Because control works on a decimal system, the operator needs no conversion tables. If work prints call for holes or locations other than those punched in the tape, the operator can assume control of the table.



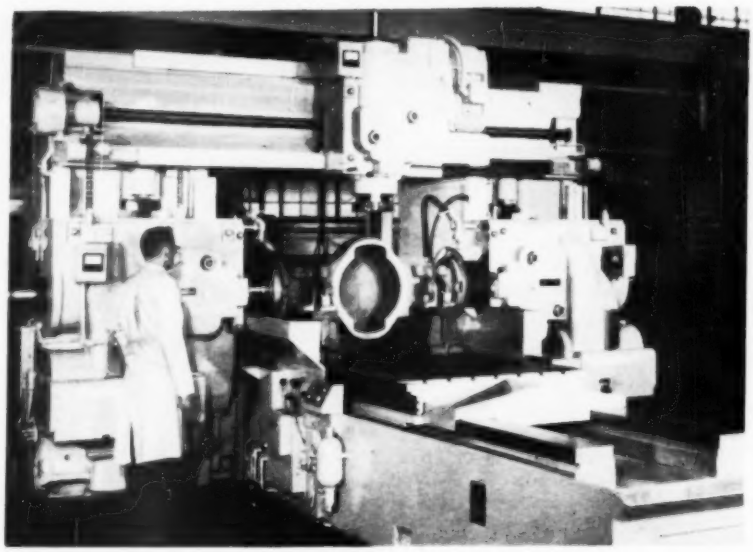
The table operates in all four work quadrants, accepting either plus or minus commands in either the X or Y axis or the X and Y axes. In the latter case, traversing (360 ipm) and final positioning (20 ipm) take place in both axes simultaneously. Initial setup can be made any place within operating limits of the table. The initial setup can be made to agree with any numerical position.

Design features include: electric motor drives; ball screw drive, hardened ways, and roller bearing mountings; printed circuits in the control console; low backlash mechanical drive elements; axis reversing switch to enable the operator to position for mating, but reversed, locations with the same tape.

Cincinnati Bickford Div, Giddings and Lewis Machine Tool Co, Cincinnati, Ohio

MORE DATA? Circle 57, inside back cover

Cincinnati Adds Heavy-Duty 600 Series Milling Machine



A heavy-duty 600 Series has been added to the Cincinnati HyPowermatic line of milling machines. Like machines in the smaller series, it is available in plain or duplex models, with conventional or tracer control.

All the features of the standard series, including building block construction, have been carried over to the 600 Series, with the exception that the bull gear on the spindle has been increased to 30 in. Additional spindle heads, automatic variable feed, and automatic quill retraction can be supplied. HyPowermatics are capable of taking heavy conventional milling or climb milling cuts with either high speed steel or sintered carbide cutters.

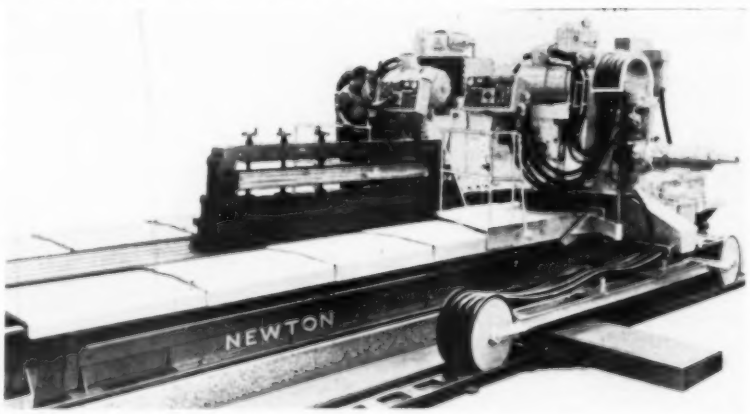
Specifications include: 50-hp motors on horizontal spindles; 16 spindle speeds, from 8 to 320 rpm with higher series available; No. 60 spindle taper; vertical movement of spindle carrier, 20 in.; table width, 26 to 50 in.; table travel, 8 to 20 ft; table traverse rates, ½ to 75 ipm feed, 300 ipm rapid traverse.

The machine illustrated is a 650/-5012 Triplex used here to machine a 54-in., 1440-lb, alloy steel drive axle housing for a dump truck. Both ends of the housing are milled simultaneously at a feed rate of 8½ ipm and a cutting speed of 203 sfpm. About ½-in. of stock is removed. Two spring pads at the top of the workpiece are milled by the cutter on the vertical carrier, powered by a 30-hp motor.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

MORE DATA? Circle 58, inside back cover

Cavity Miller Machines Ferrous and Nonferrous Metals



This Farrel-Newton cavity miller, which will mill opposite sides of a workpiece simultaneously under three-dimensional magnetic tape control, is said to be the first machine of its type to mill ferrous and nonferrous metals. It can be supplied in a variety of sizes and specifications.

The machine consists of a worktable and two opposed traveling-column milling units. Each column carries a head saddle, which travels on a vertical slide, and each head saddle carries a horizontal milling head having in-out or depth travel on a horizontal slide. The two milling units are used independently under either manual or tape control. Each spindle is driven by a 60-hp variable-speed dc motor which, in conjunction with four mechanical changes, gives a cutting speed which ranges from 15 to 3600 rpm.

Separate floor-mounted control panels, containing magnetic-tape transports, reading heads, and associated controls, are provided for each side of the machine. Because each side of the machine has its own tape control unit, either side of the machine can be furnished alone as an openside unit. If a duplex machine is required at a later date, a second side can be added. Also, a machine already installed can easily be extended to meet increased work-length requirements.

A rack and pinions are used for the longitudinal drive to provide maximum stiffness.

Specifications of the first machine built (illustrated), now in operation at an aircraft plant, are: worktable, 24 ft long by 30 in. wide; column travel 20 ft; head vertical travel 24 in.; head depth travel, 24 in.; feed rates of the column and the head are 75 ipm max for tape control and 90 ipm max for manual control; column traverse rate, 298 ipm.

Aluminum forgings were milled on this machine in an intricate pattern of squares, diamonds, and circles. Accuracy of the work, done simultaneously on opposite sides under tape control was ±0.0005 in. to ±0.002 in. depending on travel rate.

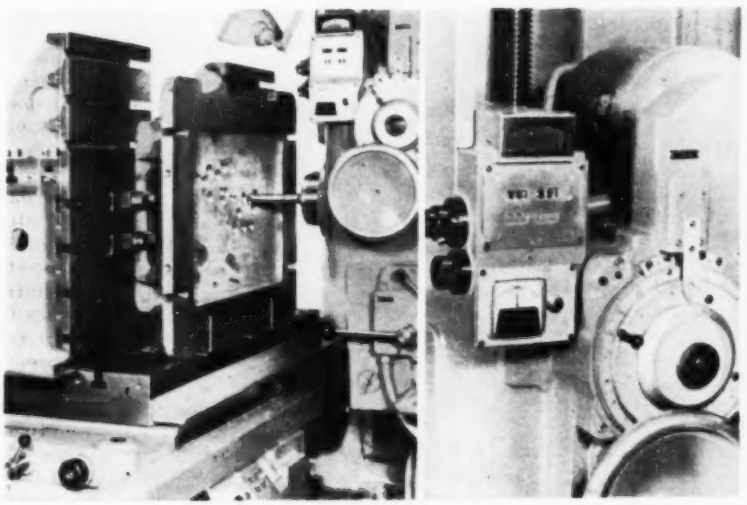
Farrel-Birmingham Co, Inc, Consolidated Machine Tool Div, 565 Blossom Rd, Rochester 10, NY

MORE DATA? Circle 59, inside back cover

Positioning System Duplicates Blueprint Dimensions

The Diatrol positioning system, developed by DeVlieg for its line of precision boring, drilling, and milling machines, will correctly position the table and spindle head to dimensions set on the dials directly from a blueprint. It measures to an accuracy of ±0.0001 in. with a positioning repeatability of 0.00005 in.

The Diatrol unit features a simple mechanical measuring system that is compact and easily accessible. It will position in plus or minus directions from a given datum point, with the numbers limited only by the counters (which read to ±1000.0000 in.) not by the length or height of the machine. The machine will do what the dials say, no matter what the setting is, and will not get lost or travel the wrong way. While one operation is being performed, another can be set into the measuring controls at the push of a button.



Master measuring bars on the Diatrol positioner are mounted on the full length of the vertical and horizontal slides. These Meehanite bars are covered by a heavy steel case for protection against dirt or damage. Because they are permanently mounted to the machine, deviations due to temperature change are said to be negligible. A series of hardened pins, 0.2-in. dia, are spaced one inch apart on the bars, and a differential transformer is used to find the magnetic center of the nub, without any physical contact.

Over-all time savings on one-shot jobs is reported to be 50% with Diatrol. The new positioning system is available for Series 2B, 3B, 4B, and 5H Spiramatic Jigmils.

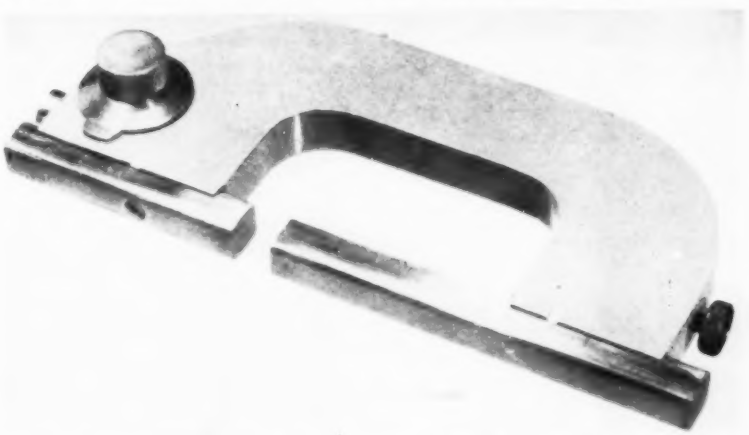
DeVlieg Machine Co, Fair St, Royal Oak, Mich

MORE DATA? Circle 60, inside back cover

Micrometer Accurate to 20 Millionths Over Wide Range

A hand micrometer, developed by Indur Co of Ottawa, is reported to be accurate to 0.00002 in. throughout a range of 0 to 4.1 in. for outside dimensions and 0.5 to 13.6 in. for inside dimensions. Micrometer, which is guaranteed for two years, costs $110. More accurate models are available at higher cost.

The wide range is made possible by a movable anvil which can be positioned in the frame at ½-in. intervals and, for ID measurements, an optional set of four jaws which fit on the ends of the anvil and spindle bar. The anvil, made of hollow square tubing, has tapered holes drilled in the bottom at ½-in. spacings. The holes are connected by a narrow slit to permit a locking bolt to slide from hole to hole. When the bolt is pulled into one of the holes, it forces the anvil both downward and sideways against the groove in the micrometer frame.



No vernier is used on the micrometer. Movement from the thimble to the spindle is transmitted through worm gears which are radially preloaded to eliminate backlash. Dimensions are read directly from the sum of the readings on the anvil, spindle bar, counter (located on side of frame at left) and thimble. Thimble has graduations of 0.00005 in. and the closest 0.00001 in. can easily be estimated. Measuring pressure on the jaws is approximately 5½ lbs and is kept uniform by the constant torque thimble. It is claimed that the large measuring surfaces will remain true for a long time because they do not rotate.

According to the manufacturer, thermal expansion has been minimized to the point where it causes no significant error. The spindle is preloaded against an end bearing located inside the frame closet to the anvil. Thus, any thermal expansion of the spindle will move only the end opposite from the end bearing. Insulating plates are used to prevent heat transfer from the operator's hands to the hollow frame.

Indur Co, Ltd, 7½ Villa Crescent, Ottawa, Canada

MORE DATA? Circle 61, inside back cover

DOW | MAGNESIUM PRODUCTS

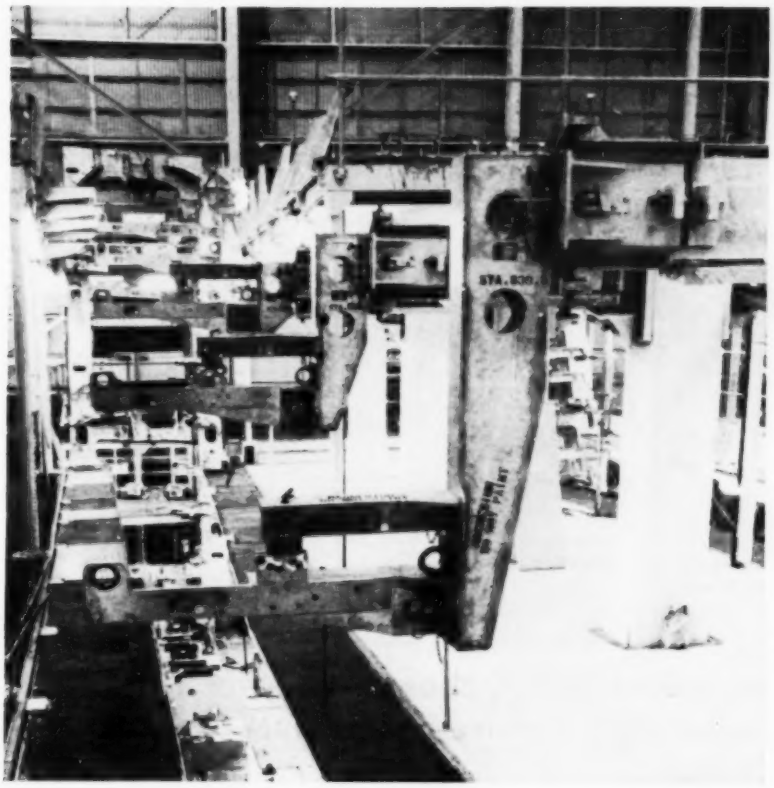
NEW BOEING 707 is first JET to fly in commercial service in the U. S. Extensive use is made of magnesium tooling plate in building the 707.

LIGHTER, FLATTER MAGNESIUM TOOLING PLATE

helps build new jet airliner

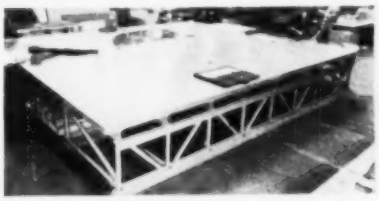
The use of magnesium tooling plate increases rapidly as more and more plants discover its important benefits. Weight savings, precision flatness, fast machining and dimensional stability are reasons for its use in many applications. Take Boeing, for example . . .

Magnesium tooling plate and extruded channels are in widespread use at Boeing's Renton, Washington, plant where the new 707 jet airliner is manufactured. Welded magnesium plate and channel are used as parts for an overhanging wing jig (see photo). Because of magnesium's lightness, such locators can be long and yet be rigid. Furthermore this lightness results in a less



severe load on the basic structure permitting it also to be lighter and less expensive. Other magnesium jigs which can be positioned and put in place by hand can easily be positioned without mechanical equipment. If made of steel, a sizable working party or a crane would be needed each time they were moved.

The top of a 20′ x 20′ master template table at Boeing was constructed of two thicknesses of $1\frac{1}{2}$″ magnesium plate. No machining was required on the plates, permitting a substantial cost savings over a previous master template table made of steel plate, which required considerable machining. The stability of magnesium has maintained the necessary tolerances during use. A large 707 door locating jig also made of magnesium tooling plate can be handled by two men, and can be easily stored when not in use. The stability of welded magnesium structures in this and other applications is invaluable for large assembly jigs.



* * *

The lightness, flatness, stability and stiffness of magnesium tooling plate have likewise greatly increased its use as a base plate for plaster forms.

There are other advantages that make lightweight magnesium desirable as tooling plate material: Manually positioned welding jigs are easier to handle, weld spatter doesn't stick, high heat conductivity prevents warping from local heating, and nonmagnetic magnesium used for spot welding jigs causes no interference. Wherever magnesium tooling plate is used, it means less frequent use of lift trucks and other power handling equipment.

* * *

NEW MAGNESIUM TOOLING PLATE MANUAL. This handy, fact-filled reference book covers shop working characteristics, properties, design, etc., for magnesium tooling plate and tubing. For your copy, contact any Dow sales office or write to Magnesium Products Sales, THE DOW CHEMICAL COMPANY, Midland, Michigan, Department 1339F7-13.

MACHINING TIME CUT TO SHREDS

Drilling, milling, reaming, sawing and other machining operations can be performed on magnesium with surprising economy. Magnesium machines faster and easier, reducing production time and tool wear to a minimum.

LONG SUIT: WELD STRENGTH

Magnesium tooling plate is easily joined by inert gas arc welding. High strength welds and joint efficiencies up to 95% are common. Any joint commonly welded with steel can be welded with magnesium, allowing exceptional versatility for tooling jobs. Magnesium can also be joined by common methods of mechanical fastening.

MAGNESIUM TOOLING PLATE IS AVAILABLE FROM STOCK AT:

E. F. Bailey Company
Seattle, Washington

Clendenin Bros., Inc.
Baltimore, Maryland

Copper and Brass Sales, Inc.
Cleveland, Ohio; Detroit 12, Michigan

Fullerton Steel and Wire Company
Chicago 35, Illinois

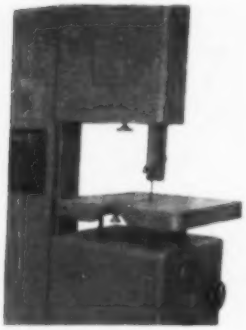
Hubbell Metals Inc.
St. Louis 3, Mo.; Kansas City, Mo.; Marietta, Ga.

A. R. Purdy Co., Inc.
Lyndhurst, New Jersey

Reliance Magnesium Company
Los Angeles 58, California

Joseph T. Ryerson & Son, Inc.
Dallas, Texas

THE DOW CHEMICAL COMPANY · MIDLAND, MICHIGAN

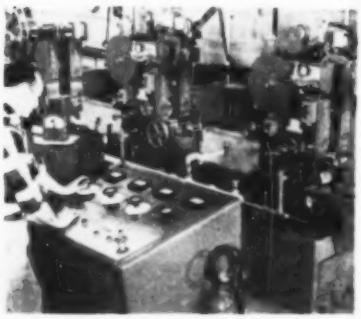


20-in. Metal Cutting Bandsaw Incorporates Speed Selector

Model 86 is equipped with Quik-Set speed selector that permits instant dial adjustment of all speeds from 38 to 4100 sfm. Table tilts 45° right and 15° left on a heavy-duty single action trunnion which affords maximum rigidity. Choice of hardened block guide set, ball bearing guide set, or angle-insert blade guides.

Powermatic Machine Co, McMinnville, Tenn

MORE DATA? Circle 62, inside back cover



Wire Mill Produces Precision Copper Tape at 1000 fpm

Model 082 three-stand copper wire mill produces thin copper tape to critical dimensions at continuous production speeds up to 1000 fpm. Entry wire is 0.129 in. Exit tape is 0.324 by 0.0159 to tolerances of ±0.005-in. width, ±0.00005-in. thickness, and ±0.001-in. on radius edges. Exit tape is automatically gaged by an electro-limit width gage and a beta ray thickness gage.

The three-stand mill, with separate dc variable speed drives, is equipped with carbide shell rolls having both internal and external cooling. Tension and speed synchronization are regulated by dancer roll controls. The entire line is controlled by one operator.

Fenn Mfg Co, Fenn Rd, Newington, Conn

MORE DATA? Circle 63, inside back cover

New Electrical Discharge Machine Series Reported to Reduce Die Production Costs

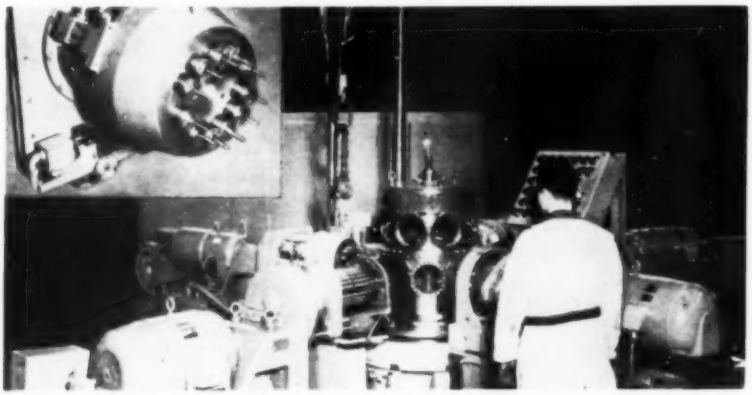
RP-100 Series can be used to produce extrusion dies, powdered metal dies, cold heading dies, blanking dies, multiple pierce dies, and 3-dimensional cavities at 25 to 50% savings over mechanical methods. They use any Elox vacuum tube or RC power supplies.

Features include electrical, mechanical or hydraulic power feed; optional precision locating devices and precision electrode holding devices; worktable surface of 7 x 17 in. or 12 x 18 in. (precision cross feed construction) that can be supplied with end measuring rods or optical measuring devices as required; 3¾-in.-dia quill that travels 10 in. vertically; complete dielectric oil system consisting of reservoir, pumps, and filters, built into machine base.

Units, constructed to JIC standards, use 27 x 61 in. of floor space.

Elox Corp of Michigan, 1830 N Stephenson Hwy, Troy, Mich

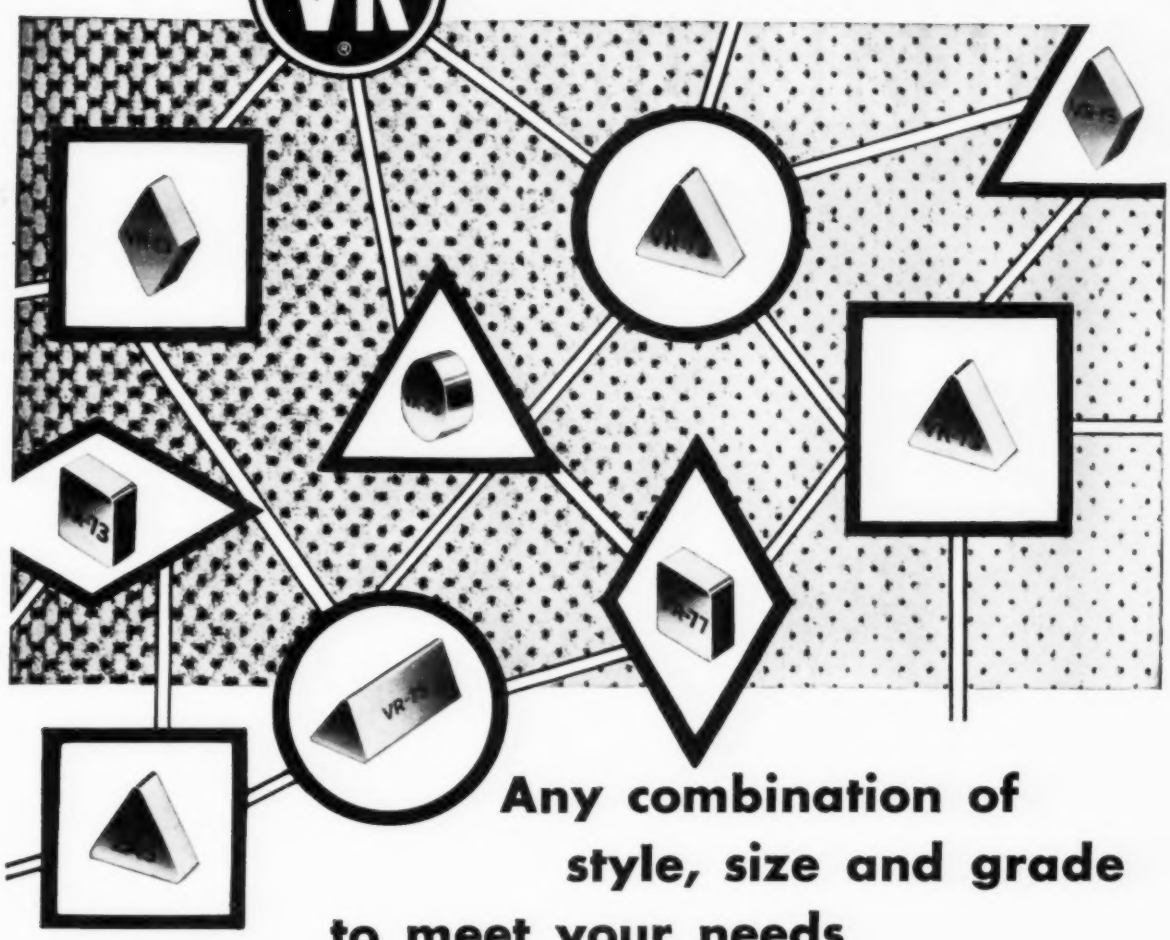
MORE DATA? Circle 64, inside back cover



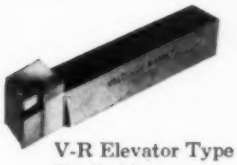
INTERNAL FACE OF A CRANK CASE is back counterbored on this drilling, reaming, and tapping machine. Back counterboring here is done by a special spindle which brings the tools automatically into cutting position, allowing them to be rotated in the case to complete the operation. 21 holes are drilled, reamed, counterbored and tapped in each of nine cylinder heads. One bank of the crank case is processed at one pass—*Zagar, Inc, 23886 Lakeland Blvd, Cleveland 23, Ohio*

MORE DATA? Circle 65, inside back cover

V-R carbide inserts...



Any combination of style, size and grade to meet your needs



V-R Elevator Type Toolholder.

V-R Solid Base Type Toolholder.

Complete machining flexibility is possible only when you can get exactly the right combination of carbide insert grade, size and style . . . when you need it. That's why V-R manufactures the *most complete line* of inserts available anywhere. Regardless of the operation to be performed or the type of material to be machined, there's a V-R carbide insert that's best for your job. Ask your V-R representative. He will be glad to show you how V-R's complete line can provide fast answers to your cutting tool problems.

Send for Catalog VR-58 for complete details.

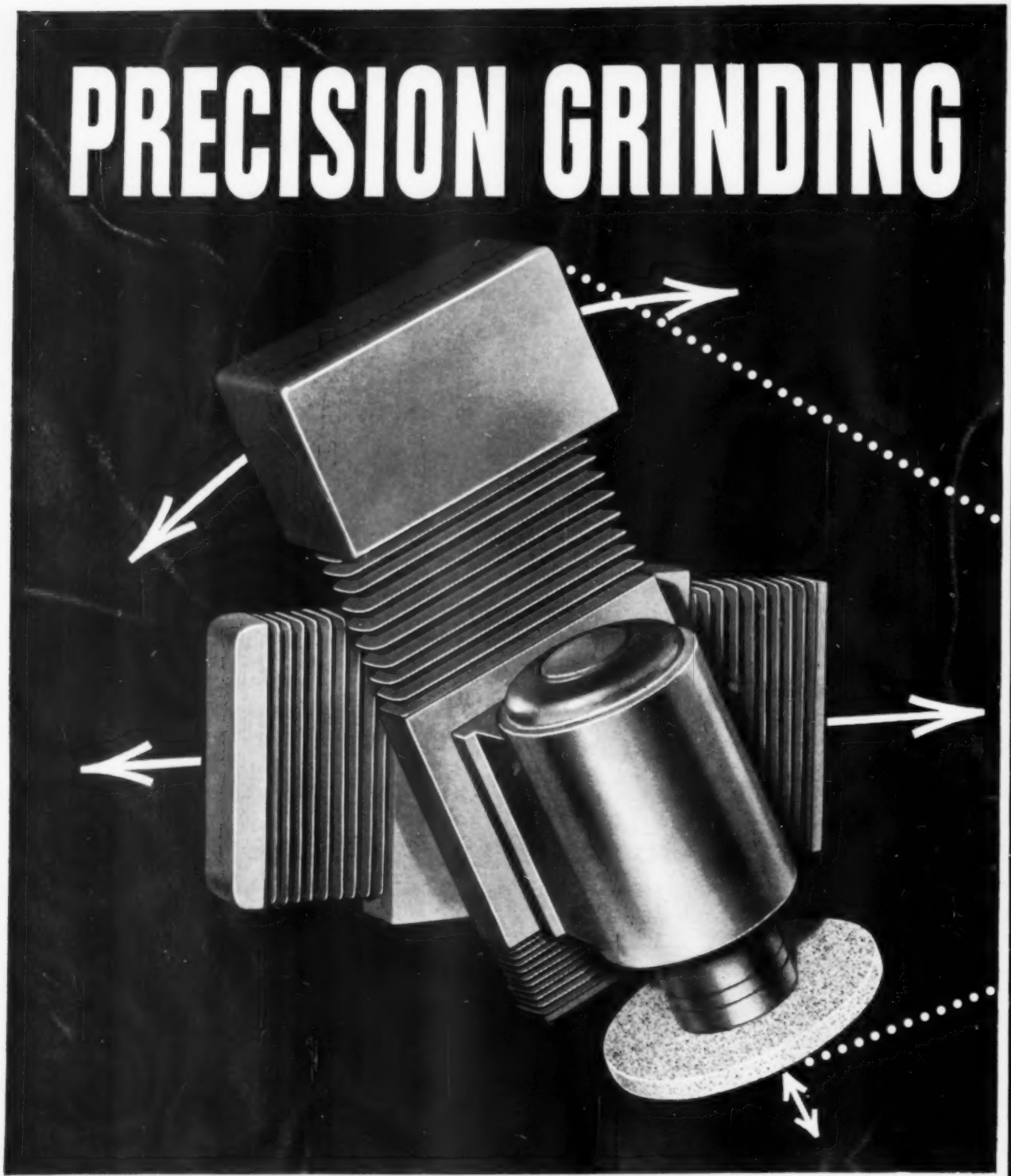
V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

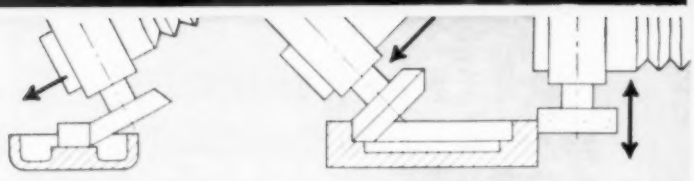
C-743

838 Market Street • Waukegan, Illinois

PRECISION GRINDING



Diagrams show typical applications of Frauenthal Standard Slide Units to a variety of grinding problems.



CIRCLE 268 READER SERVICE CARD

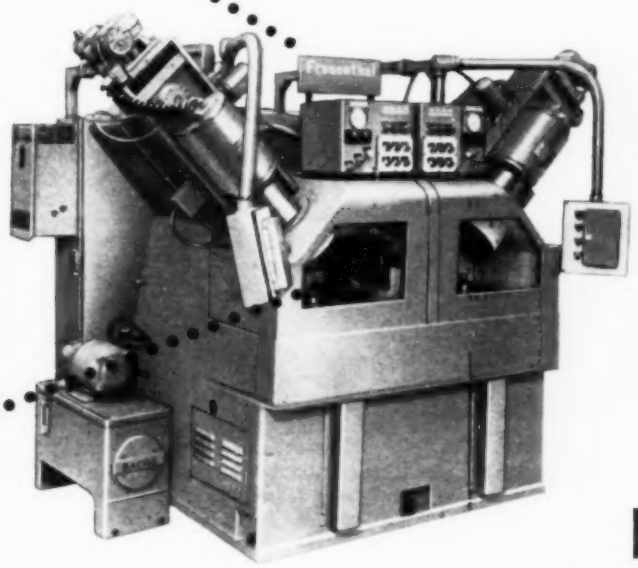
at any angle!

Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.

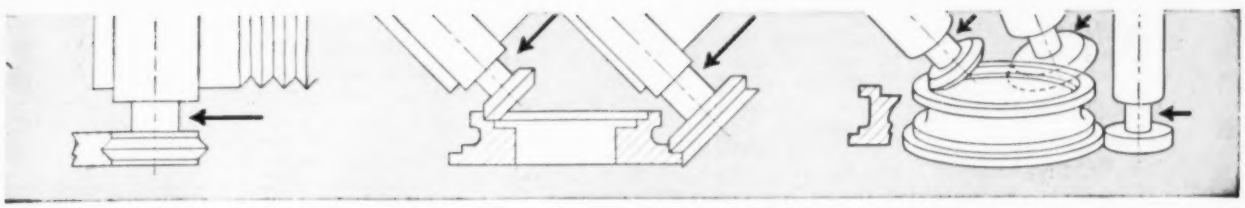


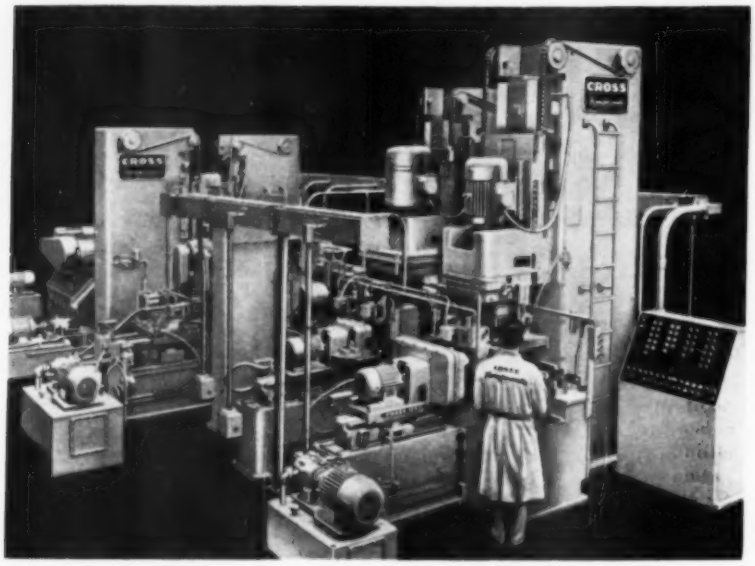
Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

Send a print of your "problem grinding part" and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.

F-256 R





Cross Bearing Cap Transfer Machine Uses New Handling and Machining Techniques

A 30-station transfer machine, built by Cross Co for a European auto manufacturer, uses techniques in handling and machining bearing cap clusters that are said to differ from conventional methods. The machine drills, taps, mills, and saws the crankshaft bearing caps at a rate of 436 caps (109 clusters) per hour at 100% efficiency.

Because of unusual operations required, due to design differences in the cap, the cluster is transferred and machined with its center-line at right angles to the direction of transfer movement.

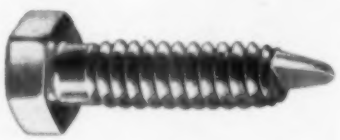
A new turn-over-transfer mechanism lifts the cluster out of station 19, turns it over and lowers it into the next station. A similar mechanism is used to index the part 140° and place it onto the shuttle-transfer bar mechanism that carries it to the clamping fixture in the sawing station at the end of the machine. Here a three-cutter gang-sawing setup saws the clusters into individual caps.

Bearing cap bolt holes are drilled and reamed from the top face side. As a result, wander from drills ground slightly off-center does not affect hole center distances when locating pins enter them for clamping in the sawing station. Because part movement is prevented, there is less breakage of the carbide-tipped saws, which represent 60% of the perishable tooling cost.

An unusual vertical way-type head combines both an 8-spindle chamfering unit and a gang-milling cutter unit. It straddles station 21 and 22 for chamfering bolt holes and milling anchor lock notches. Power is furnished by a single 5-hp motor through a gear train in the head which also powers the drive shaft that rotates the cutter arbor.

Cross Co, Box 3835, Detroit 5, Mich

MORE DATA? Circle 67, inside back cover



Screw for Use in Sheet Metal Drills and Taps Its Own Hole

New type of screw for use in sheet metal, plastic and wood drills and taps its own hole. It is designed for power driving and is said to be suited for both manual and automated operations.

Called the Self-Drill, Self-Tap Screw, the fastener is reported to eliminate many problems in drilling, positioning and hole matching. It can be pre-assembled with various types of plain, special, lock and sealing washers.

Reliance Div, Eaton Mfg Co, Massillon, Ohio

MORE DATA? Circle 68, inside back cover

Die-Casting Alloy Developed For Service Above 500 F

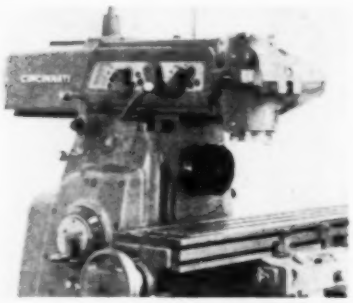
Alloy consisting of magnesium with one percent thorium and one percent manganese is claimed to be the first die-castable metal alloy for service above 500 F. It retains good mechanical properties through 800 F.

Separately die-cast test bars showed average tensile strength of 30,200 psi at 70 F, 16,800 psi at 400 F, 12,400 psi at 600 F and 7,800 psi at 800 F. Density is 0.064 lbs per cu in.

The alloy, designed HM11XA, can be die cast in regular equipment with a minimum of changes from standard procedure. Radiographic studies indicate that parts can be die cast in HM11XA with internal soundness equal to parts die cast in AZ91B.

Dow Chemical Co, Midland, Mich

MORE DATA? Circle 69, inside back cover



Independent Overhead Spindles Offered for Cincinnati Millers

Independent Overhead Spindle which provides additional range and versatility for toolroom milling machines is available for any Cincinnati knee and column type milling machine. It can be specified on a new machine or installed on a machine already in use.

The spindle is built in a 3-hp size for use on 2MI, 3MI, and small Dial Type machines, and in a 5-hp size for larger Dial Type machines, High Power, and Dual Power machines.

Both units are self-contained. Motor, drive mechanism, speed change mechanism and controls function separate from the same units on the machine itself. Units can be ordered with either a fixed spindle head or a head with provision for hand quill feed. Each head swivels 360° and can be mounted on the face of the spindle overarm or onto a right angle elbow for a double swivel arrangement.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

MORE DATA? Circle 70, inside back cover

CIRCLE 270 READER SERVICE CARD ►

Quality . . . the best economy of all

He does a better job when he can see what he's doing

You increase operator efficiency as well as production when you use transparent, heavy-duty Sunicut cutting oils. Operators work better, because Sunicut oils let them see tools and workpieces, see the finish, see micrometer graduations.

Sunicut oils don't stain hands and clothing. They pump easily, wet metal fast, and give excellent extreme-pressure lubrication.

To prove to yourself the economy of Sun quality, ask your Sun representative to help you select the right grade of Sunicut for your heavy-duty cutting requirements. Or write to SUN OIL COMPANY, Dept. I-13, Philadelphia 3, Pa.

•

In Canada: Sun Oil Company Limited, Toronto and Montreal.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO

AO H-3 Face Shield

AO Face Shields cut accident costs by providing quality eye and facial protection on metal sawing, chemical work, buffing, sanding, light grinding, incandescent lamp, electronic tube, glass bottle manufacturing, bottling and other operations. The H-3 (shown) has a back headband of durable vulcanized fiber. Fits lower head snugly, comfortably. Easily adjustable — won't pull hair. Standard genuine leather sweatband and snap-on acetate window, are easily replaced.

FEATURES — Slotted windows allow for expansion and contraction in heat — extra deep spark deflector for added protection — extra inch nose clearance for better ventilation, reduced fogging — many other advantages.

LIKE AO SAFETY GLASSES...

These AO Accessories Cut the High Costs of Eye Accidents!

AO 9706 HELMET

This new type helmet combines light weight with other proven features. Made of moisture resistant dark gray fiber glass. Curved chin, light front aluminum glass holder. Dielectric. Headgear adjustment is simple — gives welder a comfortable fit instantly.

AO 350 AF SUPER-CLEAR

Tested against "the field" (8 other anti-fogging liquids), Super-Clear was way ahead in providing clarity LONGER! Tests were conducted in a refrigerated unit at 40° below, also in an oven controlled to body temperature of 98°. One user reported Super-Clear as "at least 100% better than the liquid previously used. Remember, Super-Clear is a glass and plastic *cleaner* as well as an anti-fog. Just spray it on — wipe it off!

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU

Always insist on AO Trademarked Safety Products

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

These standard bearings have special qualities

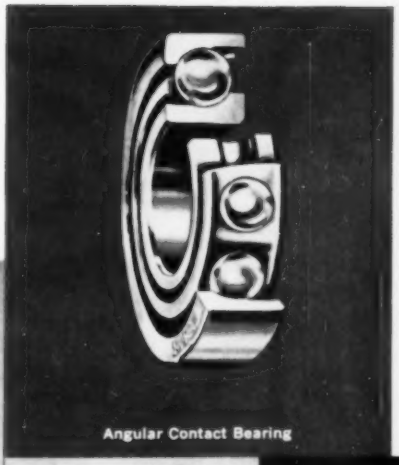
—*does this mean they cost more?*

Not necessarily.

*Take the spherical roller thrust bearing, for example. SKF bearings of this type can carry unusually heavy loads: either thrust or combined thrust and radial. Unmatched for single bearing performance when high thrusts must be carried at high speed. And they are completely self aligning. Because of these qualities, engineers choose them for heavy-duty applications over large angular contact ball bearings.

Yet this standard SKF bearing is competitively priced. Furthermore, it is promptly available in 25 sizes ranging from 4.3″ to 14.9″ I.D.

Moderately-priced, high-quality ball and roller bearings are continually rolling off SKF's production lines. So why not get all the facts on those you can use? Just call the nearest of our twenty-five sales offices. 5927


Angular Contact Bearing

"Tyson" Tapered Roller Bearing

Single Row Deep Groove Bearing

Spherical Roller Bearing

Cylindrical Roller Bearing

*Spherical Roller Thrust Bearing

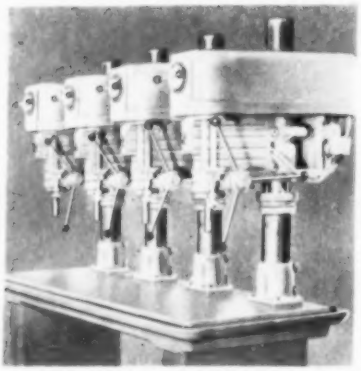
Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.



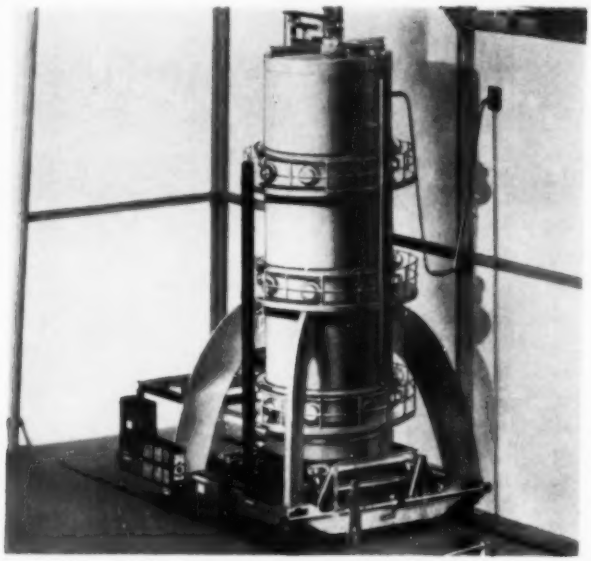
Powermatic Introduces Multiple Spindle 20-in. Drill Presses

Powermatic drill presses, with dial speed selector and mechanical feed attachment, are available in two to six-spindle models. Standard equipment includes production table and head raising machanism, and they can be suppled with variable or four-speed drive, powered by 1 or 1½-hp motors.

Specifications include: six-spline carbon steel spindle in 2¾-in. quill; 4-in. dia column with ½-in. wall thickness; spindle speed range from 250 to 1750 rpm with 1800-rpm motor, 170 to 900 rpm with 1100-rpm motor; quill travel 6½ in.; capacity, ¾ in. in steel, 1 in. in cast iron; feed rate, 0.002 to 0.012 in. per spindle revolution; table size built to user's specifications.

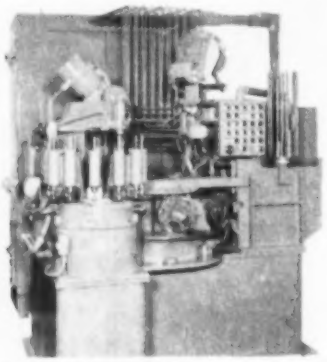
Powermatic Machine Co, McMinnville, Tenn

MORE DATA? Circle 71, inside back cover



MISSILE MOTOR CASES or general industrial parts 70 in. in dia and 28 ft long, weighing up to 4 tons, can be clean hardened or gas carburized in this gas-fired, radiant-tube, controlled-atmosphere heat-treating furnace. Unit is of vertical, drop-bottom design and stands over 42 ft above floor level on a specially designed gantry type mobile car. Operating temp is 1850 F with provision for higher temps if desired. Furnace travels under its own power to quench its load into oil, water, or nitrogen gas pits.—*Commercial Steel Treating Corp, Detroit*

MORE DATA? Circle 73, inside back cover



300 PUMPS PER HOUR are assembled on this hydraulic machine which also sub-assembles two check valves on two auxiliary dial index tables. Pump consists of check valves, cup plug and oil seal. Check valve parts are ball, spring, O-ring, retainer and snap-ring —*Gray Equipment Co., 13600 Ford Rd, Dearborn, Mich*

MORE DATA? Circle 72, inside back cover

Welding Process Developed For Use on Thin Sheet Metal

An inert-gas consumable-electrode welding process, called Short-Arc welding, is reported to make possible fusion welding of common metals in the 0.030 to 0.1-in. thickness range. It can be used in all positions and on all types of joints.

A new type of power supply, incorporating a drooping characteristic, was developed to control surge currents so as to limit the time duration of arc outages, prevent wire ejection, and produce a stable buzzing type of arc. This arc, operating in the range of 30 to 125 amps, 14 to 19 v, short circuits dozens of times per second, producing a small cold puddle which pinpoints the arc heat.

Other key factors in this welding were the evaluation and selection of shielding gases and the development of equipment to feed wires as small as 0.020 or 0.030-in. dia.

Linde Co, Div of Union Carbide Corp, 420 Lexington Ave, NY 17, NY

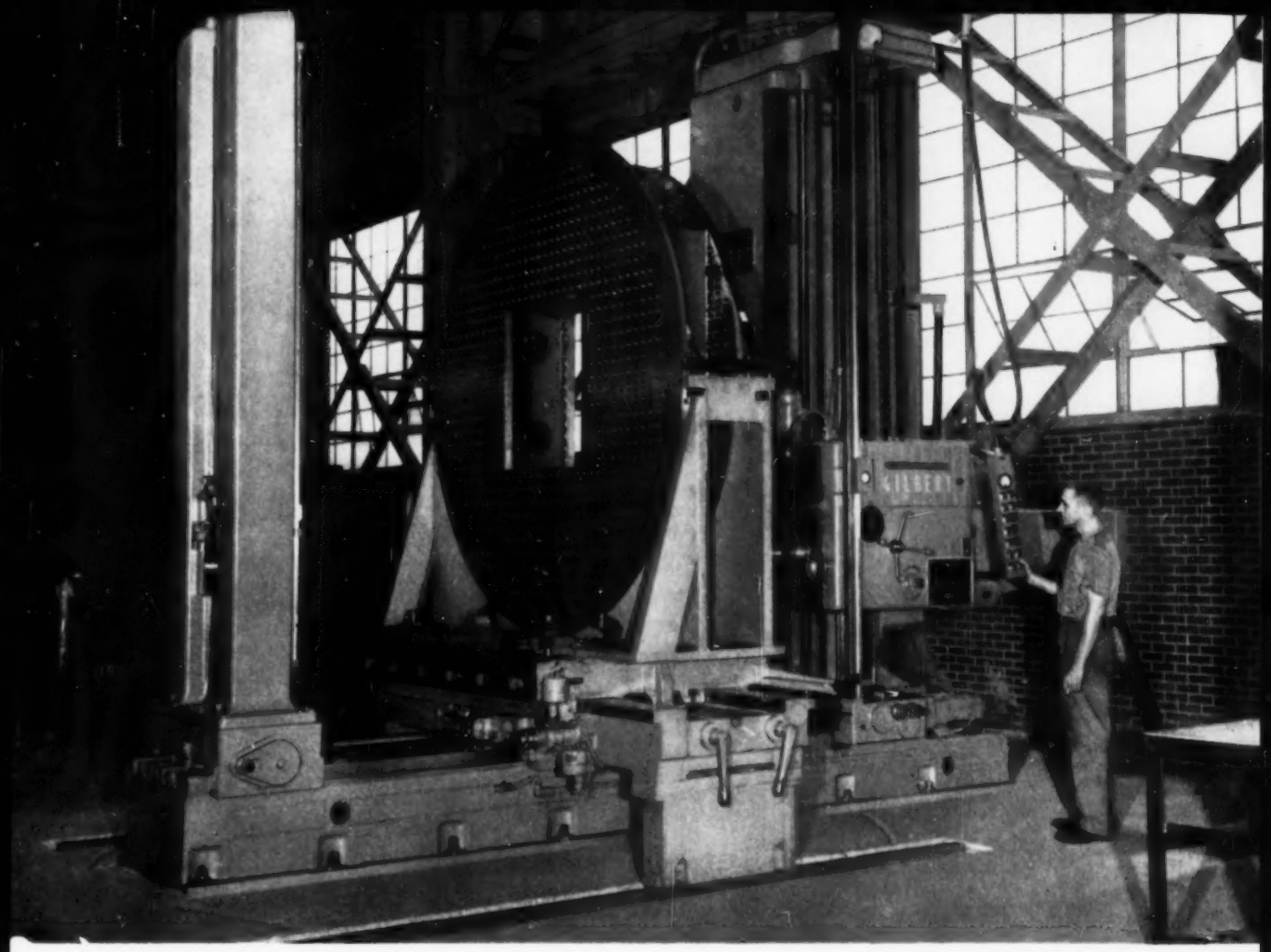
MORE DATA? Circle 74, inside back cover

Power Squaring Shear Handles Up to 10-gage Sheet Steel

Model 10-U-10, a 10-ft, 10-gage unit, is designed to shear accurately any sheet from lightest gages through to 10-gage sheet steel. Engineered for smooth operation and continuous production at full rated capacity, the machine has been field-tested at greater than normal capacity ratings. Vibration is reported to be practically non-existent because of massive machine tool standard castings.

Peck, Stow & Wilcox Co, Southington, Conn

MORE DATA? Circle 75, inside back cover



Courtesy Combustion Engineering, Inc.

Combustion Engineering uses Gilberts for precision boring on atomic reactors

It takes an unusual boring mill (specifically, a Cincinnati Gilbert) to meet the specifications on this job:

(a) diameters within .001",

(b) parallelism of center line of holes to center line of plate within .0001" per inch,

(c) parallelism of flat surfaces within .010",

(d) 32 R.M.S. surface finishes.

These are some of the machining requirements on this part for a fast breeder reactor built in the Chattanooga plant of Combustion Engineering, Inc., pioneer manufacturer in the nuclear ficid. They are typical of the quality of work assigned to this Cincinnati Gilbert table type horizontal boring mill. Automatic positioning makes work-handling fast and precise.

A number of other Gilbert boring mills are producing similar close-tolerance work for Combustion Engineering—proof that "those who buy Gilbert buy Gilbert again."

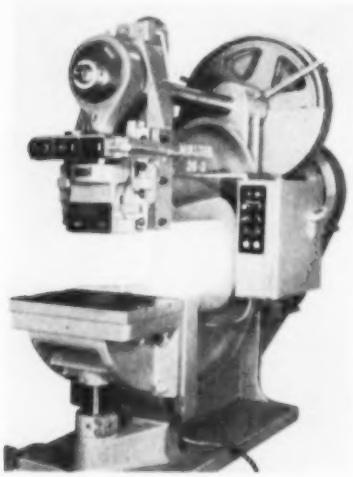
New Bulletin 1157 will show you why Gilbert boring mills do so many things so well.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.

Ask for free catalog 1157

GILBERT

CIRCLE 273 READER SERVICE CARD



Deep Throat Punch Presses Offered for Light and Medium Jobs

Series 20, available in capacities of 15, 25, and 35 tons, is designed for light and medium punching, cutting, and flanging on large pieces. Press has a heavy section C-type one-piece, high alloy cast iron frame which forms a deep throat that allows punching to the center of a 60-in. circle. Two extra long removable gibs guide the slide. Standard slides have removable slide punch caps and cross-bar knockouts. Single gearing is available to provide slower operating speeds.

Units can be equipped with an adjustable bed when varying die space is needed. Combination air friction clutch and brake permits inching the punch down to a center mark prior to tripping.

Minster Machine Co, Minster, Ohio

MORE DATA? Circle 76, inside back cover

Wet Blaster Designed to Hone, Clean, Deburr and Blend Metal

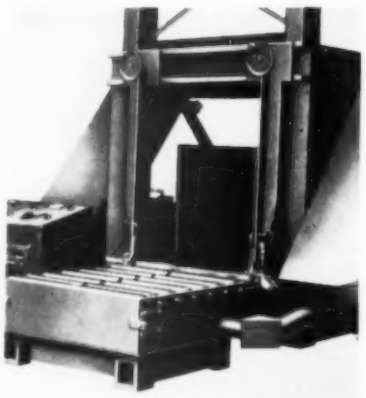
Floor model wet blaster, Liqui-Breez Model LB-1002, is designed to perform honing, cleaning, deburring and blending operations.

In honing, the cutting efficiency of high speed steel and tungsten carbide cutting tools can be increased as much as 500%. In cleaning, the Liqui-Breeze removes all minute particles and foreign matter from metal surfaces. In deburring, this method is highly successful in removing both loose and tight burrs. In blending, directional lines caused by machining and grinding can be easily removed to prepare surfaces for ploting or painting.

Size of the floor model is 67-in. high. Cabinet is 24-in. dia, with a floor working area of approximately 10 sq. ft.

Tobin-Arp Mfg Co, 6400 Penn Ave South, Minneapolis 23, Minn

MORE DATA? Circle 77, inside back cover



Largest Horizontal Band Saw Has 40x40-in. Cutting Capacity

Model T-40, claimed to be the largest horizontal band saw on the market, has a 40 x 40-in. capacity and is designed to cut large die blocks, solids, structural steels, and other materials. It is available in both a light and heavy series.

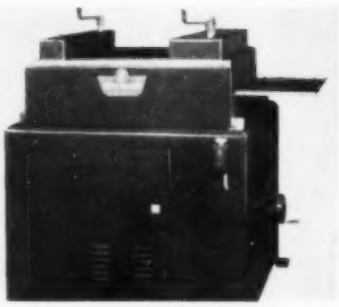
The light series features variable speed drive, large trussed and cross-braced columns, a calibrated valve to set feed pressure, ball bearing blade guides (carbide auxiliary guides optional), 2-hp drive motor, and separate hydraulic pump.

The heavy series has, in addition, a powered conveyor table, hydraulic blade tension control, hydraulic vise, powered chip removal conveyor, large coolant pump, and direct reading tachometer which shows blade speed in feet per minute.

Model T-40 weighs 8,000 lbs, is 109-in. wide, 96-in. deep, 112-in. high. Blade length is 26 ft., 9 in. by 1¼ in. by 0.035 in.

W F Wells and Sons, Three Rivers, Mich

MORE DATA? Circle 78, inside back cover



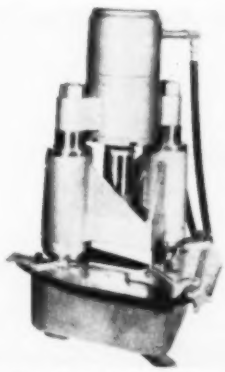
Straightener Handles Parts Up to 20 in. Wide

Unit is designed to reduce expensive hand-fitting in assembling such products as office machines and appliances, as well as to provide improved performance for functional parts such as clutch disks and backing plates, and better appearance for painted or plated items.

Model handles flat stampings as well as coil and strip up to 20 in. wide and will smooth and flatten to within 0.001-0.002 in. at feed rates from 10 to 50 fpm. Features include a two-point adjustment for fast, precise setup and changeover, and four separate gear trains to drive all rolls, equalize drive and bearing loads, and provide smooth, quiet, high-speed operation. Straighteners are available in self-contained, bench-height cabinet and portable models, with flat or angle heads, variable speed drive, and reverse switch.

Cooper Weymouth, Inc, 603 Honeyspot Rd, Stratford, Conn

MORE DATA? Circle 79, inside back cover



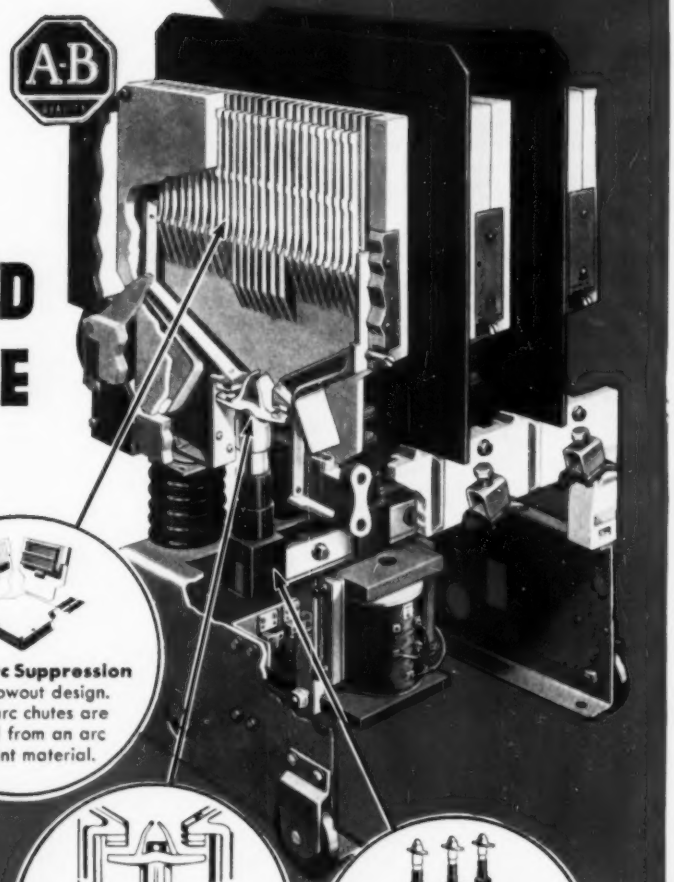
Notch-Bending Press Operates At 7 or 12 Strokes per Minute

Model 610 is available with a 1½-hp motor for operation at 7 strokes per min; price is $1073. With a 3-hp motor and offering 12 spm, unit costs $1178.

Work is notched at one side of the press, then is moved to the opposite

Here's the inside story of industry's

MOST RUGGED HIGH VOLTAGE SWITCH



THIS SOLENOID AIR BREAK CONTACTOR IS THE HEART OF THE A-B STARTER LINE

A tremendous operating life has been built into these new A-B high voltage, air break starters by using the same simple solenoid design—with only ONE moving part—that has proved good for millions of trouble free operations in Allen-Bradley low voltage starters. A-B high voltage starters are made for all types of service and for all types of motors up to 1500 hp, 2300 v; 2500 hp, 4600 v. Send for Publication 6080, today.

Faster Arc Suppression
New blowout design. Novel arc chutes are molded from an arc resistant material.

Double Break Contacts
Silver alloy contacts never need maintenance. Vertical motion assures uniform contact pressures.

Only One Moving Part
Simple solenoid design eliminates trouble-causing pins, pivots, and flexible jumpers.

A-B High Voltage Starter with Air Break Contactor

Bulletin 1159 high voltage air break, across-the-line induction motor starter in NEMA Type 1 enclosure. All Allen-Bradley high voltage starters are equipped with current limiting fuses with interrupting capacities of 150,000 kva at 2300 v; 250,000 kva at 4600 v.

ALLEN-BRADLEY

Member of NEMA

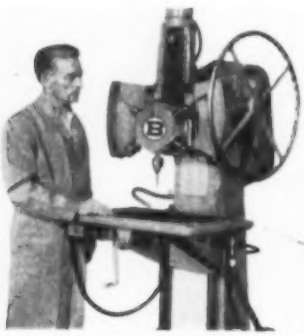
Quality Motor Control

Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

side where a single stroke of the ram bends it 90°. Standard machines have a capacity for notch-bending 4 x 4 x ¼-in. angle iron. They will cope 5½ x 5½ x ¼ in. in corner of flat sheet or angle iron. Gages are furnished for accurately locating work for notching and coping angle iron and notching corners on edges of flat sheets. Convenient location of machine controls permits operator to stop, start, and reverse ram movement readily. This enables press to be jogged either during setup or for checking accuracy when unusual precision is required. Machine requires floor or bench space of 20½ in. wide and 21 in. deep. Over-all height is 31 in.; weight, less power unit, is 500 lbs.

W A Whitney Mfg Co, 636 Race St, Rockford, Ill

MORE DATA? Circle 80, inside back cover



Burgmaster 6-Spindle Turret Drill Offered in Improved Model

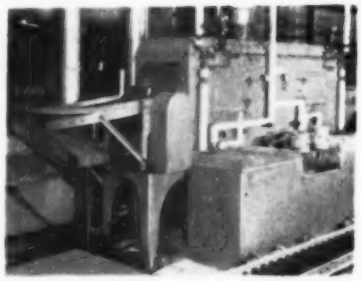
Improvements on the 1 C Model (⅜-in.-dia drill capacity) include a new, heavier, simpler transmission and clutch assembly which drives the 6 spindles. Turret head is counterweighted by an easily adjustable coil spring to provide a sensitive counterbalance for the turret and slide regardless of weight of tooling mounted in the head.

There are 12 pre-selective spindle speeds ranging from 325 to 4050 rpm. Each spindle is set to operate at its own particular desired speed. Precision depth control is provided for each spindle and is pre-selective and automatically indexed with the turret for greater efficiency.

Model has a 14 x 24-in. table with T-slots and coolant trough. Spindle travel is 7 in.; machine provides a max clearance of 28 in. from spindle nose to extra low table. Unit is powered by a 1-hp, 2-speed, 3-phase, 60-c motor.

Burg Tool Mfg Co, Gardena, Calif

MORE DATA? Circle 81, inside back cover



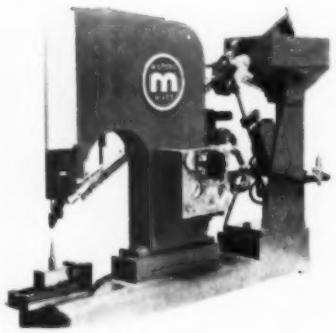
Industrial Dishwasher Cleans Parts And Tote Pans Automatically

The Panhandler, designed for operations where parts are handled in tote pans, goes through a cycle of seven different steps including loading, unloading, washing of parts and pans, return of dry pans to loading station, and delivery of refilled pans to proper departments. A single operator can direct and monitor the machine and its related equipment through all steps.

Small parts handled in steel tote pans usually have debris mixed in with the products. This may include cutting and threading oils, white drawing compound, steel burrs and chips which can jam the automatic feeds in slotting, threading, and similar operations. Once parts have been cleaned after an operation they are returned to a cleansed pan and delivered to proper departments.

Frederic B Stevens, Inc, 1800 18th St at Vernor Hwy, Detroit 16, Mich

MORE DATA? Circle 82, inside back cover



Pneumatic Riveter Has Blade Hopper Attachment

Model 56-BH has a narrow cross-sectional area of machine front, allowing for single or multi-spindle arrangement. Attachment of blade hopper permits straight inline feed of difficult-to-feed parts such as long tubular rivets, collar studs, and threaded or knurled parts.

Setting machine portion is actuated by a pneumatic cylinder that drives that setting tool through toggle linkage. Blade hopper is independently driven through a separate air cylinder. Hopper system may be continuously cycled or operated intermittently. Both drives operate from a single air and lubricating control off shop air from 60 to 150 psi. Riveter can be used in conjunction with fixed position setting tools, inline slide fixtures, or rotary tables to suit a wide range of product applications and assembly operations. Throat depth is 9 in.; stroke is 2 in. When equipped with a fixed position tool the max rivet length capacity is ¾ in.; with slide fixtures, max capacity is approx 1½ in. Range of tubular rivet diameters can be handled to a max of ⅛ in.

Milford Rivet & Machine Co, Milford, Conn

MORE DATA? Circle 83, inside back cover

Stanley Works Introducing Extra Heavy-Duty Grinders

New line, Nos. 637, 638, 640, is available in ½, ¾, and 1 hp. Cast iron toolrests are adjustable for height, angle, and distance from wheel. Extended frame construction permits grinding large, odd-shaped parts. Wheel guards are drilled for eye-shields and have exhaust outlets and spark shields. Switch is recessed. Full ball bearing construction is lubricated for life. Grinders have capacitor start and induction-type motor. Standard equipment includes three fine and three coarse grinding wheels.

Also available is a new heavy-gage welded steel construction pedestal (No. 626) designed for use with the above grinders. It has a heavy-duty door latch, water pot and tray, and is equipped with three shelves, 9⅞ in. deep for storing accessories.

Stanley Electric Tools, Division of Stanley Works, 111 Elm St, New Britain, Conn

MORE DATA? Circle 84, inside back cover

NOW DIE BLOCKS and HOT WORK DIE STEELS made of VACUUM DEGASSED STEEL AT NO EXTRA COST TO YOU!

Another FINKL FIRST gives you these advantages:

REDUCED DOWNTIME

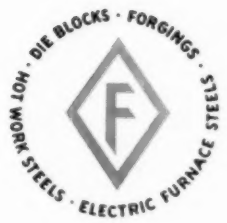
Finkl vacuum degassed steels result in die blocks and hot work die steels with greater ductility and toughness. This means size for size, and/or hardness for hardness, the degassed steel reduces the chances of breakage under severe operating conditions.

REDUCED DIE SINKING TIME

Finkl vacuum degassed steel die blocks and hot work die steels are cleaner, with about 50% fewer non-metallic inclusions, and consequently fewer tool regrinds are required. A higher lustre is possible in impressions if so desired.

POSITIVE DELIVERIES

Finkl vacuum degassed steel promotes high density centers in large die blocks, therefore reducing the possibility of a late shipment because of ultrasonic rejection.



Finkl was first with die blocks fully water quenched. Finkl was first with deep hardening nickel-chrome-moly die blocks, the forerunner of the AISI 4300 Series. And now, we are pleased to add vacuum degassed steel die blocks and hot work die steels to our line of products—another Finkl First. They represent our policy of offering our customers every advantage to reduce costs and increase production.

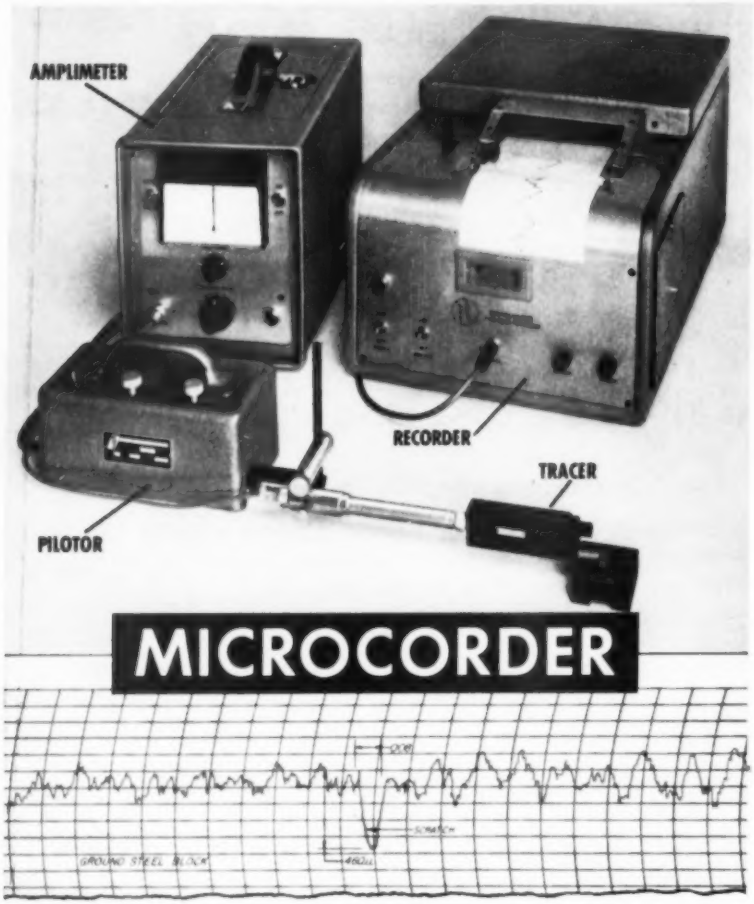
For over 80 years we have produced quality products because we believe sincerely that the "best costs the least" in the long run. For impressions that last you can depend on Finkl.

A. Finkl & Sons Co.

2011 SOUTHPORT AVE · CHICAGO 14, ILLINOIS

Offices in: DETROIT · CLEVELAND · PITTSBURGH · INDIANAPOLIS · HOUSTON · ALLENTOWN · ST. PAUL
COLORADO SPRINGS · SAN FRANCISCO · SEATTLE · BIRMINGHAM · KANSAS CITY · BOSTON · LOS ANGELES
Warehouses in: CHICAGO · DETROIT · BOSTON · LOS ANGELES

Presenting **A NEW INSTRUMENT FOR SURFACE INSPECTION AND CONTROL**



THE MICROCORDER draws a magnified roughness profile of ID, OD and flat surfaces, for any length of trace up to 2¼". From its 4"-wide chart you can readily measure the *peak-to-peak spacing* and *peak-to-valley height* of roughness irregularities — and the *width* and *depth* of pits, scratches, chatter marks and surface porosity. A wide range of magnifications is provided.

This instrument is as simple to use as a TV set, and is equally at home in shop, lab and inspection department. It is used on metals, paper, plastics, ceramics and many other materials; and it is made and guaranteed by the *pioneers* in surface-measurement instrumentation.

Detailed specifications are given in Bulletin LT138. May we send you a copy? Write —

MICROMETRICAL MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 1, MICHIGAN

Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER, WAVOMETER®, ANDEROMETER®, VAROMETER, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

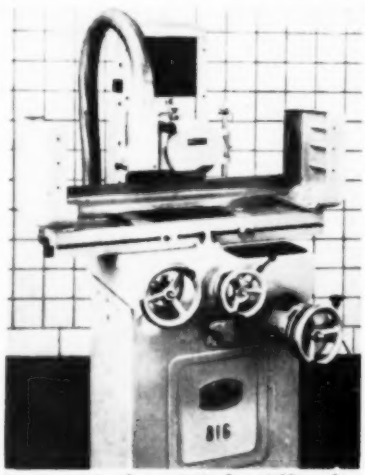
Lightweight Air-Powered Router Cuts Variety of Materials

Positive - locking, vibration - proof depth adjustment permits partial or full cut through metals, plastics, woods, or honeycomb materials. Open construction of base provides clear view of cutting operation. Air exhaust is directed downward across the router bit to expedite chip removal.

Tool weighs 3 lbs, measures 7⅛ in. in length, has a rated capacity of ¼-in. collet.

Buckeye Tools Corp, 5023 Springboro Pike, Dayton, Ohio

MORE DATA? Circle 85, inside back cover



German Surface Grinder Offered In Hand-Operated Model

Blohm Model 816 incorporates a fine feedscrew on the head elevating wheel with readings of 0.00004 in. Capacities are 8 x 16-in. table surface and 16 in. under the spindle.

Additional features include high precision ball bearing assemblies running in hardened, ground, and lapped replaceable steel ways for the longitudinal and cross movements of

Only new

TURCOAT

LOW TEMP PHOSPHATING

gives you up to 200 mg/sq. ft. of zinc phosphate coating in 2 short minutes at 95° F.

The Turcoat low temperature phosphating process provides permanent paint adhesion when used at an economical, easy-to-maintain temperature of 95°F. This temperature is *lower* than that required by other "cold" phosphating processes. It is up to 75° *lower* than temperatures required by conventional phosphating processes. You save up to 75% in steam, water, electricity and downtime costs alone!

As a base for paint, the Turcoat low temp phosphating process provides a uniformly smooth coating of up to 200 mg/sq. ft. in two minutes at 95°F. **As a base for corrosion prevention,** it provides an 1100 mg/sq. ft. coating in just eight minutes at 95°F.

Turco has waited to announce low temperature phosphating until it was thoroughly perfected and proven, through exhaustive field testing, to be the very best. For this reason, you'll find that with this new process, just as with Turco's hundreds of other cleaning and chemical processes, you are assured of trouble-free operation, ease of control, and dedicated technical service...anytime, anywhere! Write today for the full story of Turcoat low temperature phosphating, along with Turco's phosphating reference chart. There's no cost . . . no obligation.

TURCO PRODUCTS, INC.
Chemical Processing Compounds
6135 So. Central Avenue, Los Angeles 1, California
FACTORIES: Newark, Chicago, Houston, Los Angeles, London, Rotterdam, Sydney, Mexico City, Paris, Hamburg, Montreal, Manila, Naha (Okinawa)
Manufactured in Canada by B. W. Deane & Co., Montreal
Offices in all Principal Cities

TURCO PRODUCTS, INC.
6135 So. Central Ave., Los Angeles 1, Calif.

Please send full details on Turco's new low temperature phosphating process and Turco's phosphating reference chart, without cost or obligation.

NAME _____ TITLE (OR DEPT.) _____

FIRM _____

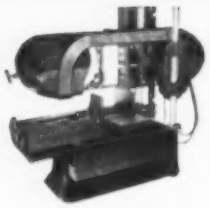
ADDRESS _____

A-M

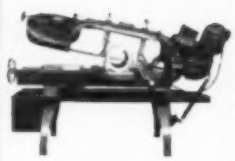
FAST | ACCURATE | ECONOMICAL

WELLS

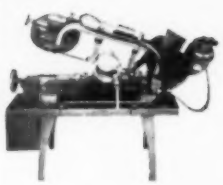
METAL CUTTING BAND SAWS



MODEL 1200
Rugged, horizontal band saw for heavy duty production cutting. Completely automatic cutting cycle. Capacity: 12" x 16". Wet cutting standard.



NO. 8
General production or maintenance saw. Capacity 8" x 16". Wet cutting system optional. Model 1000 similar with larger capacity.



MODEL 600
Dependable saw for tool and stock rooms; medium production and utility jobs. Capacity: 6" x 13". Wet cutting optional.

MODEL 58-B
Compact, modestly priced convertible saw. Horizontal capacity: 6" x 10". Vertical—7¾" x 9½". Optional wheels and handle provide complete mobility.

MODEL 49-A
Dual purpose economy saw. Use it as an upright or a horizontal band saw. Capacity: 3½" x 6". Wheels and handle optional.

MODEL 312 Roto-Veyor
Designed specifically for Wells 1200 machines. For automatic feeding on Model 1000 and No. 8 pivoted type saws, Model WJK is available.

Each Wells Saw is designed to perform every cut-off job within its range . . . quickly . . . accurately . . . economically. Wells Band Saws cut continuously at a higher level of efficiency by reducing cut-off time and saving material . . . the thin band blade removes a minimum of stock.

All controls are conveniently located, making the operation of Wells Saws simple, practical, and easy to learn. Blades are stabilized by ball bearing guides and rigid supports, adjustable for capacity. In on-the-job tests, hundreds of duplicate pieces have been cut on Wells Saws with less than .005" variation.

Outstanding performance, quality and big value are yours when you buy WELLS. Write today for NEW BULLETIN 4-C, or see your Wells Distributor.

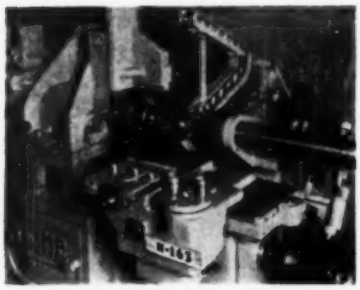
Wells

The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
505 Roosevelt Road, Three Rivers, Michigan

table and carriage; 2-hp motorized, precision-balanced ball bearing spindle; table cross-feed by ratchet lever with travel adjustment for easy and uniform cross movement.

Distributed by Hermes Machine Tool Co, 48-15 Northern Blvd, Long Island City 1, NY

MORE DATA? Circle 86, inside back cover



Automatic Loader Speeds Output On IMP Automatic Lathe

Loader feeds heavy couplings into a cradle where they are picked up by an injector head and chucked into an air-operated chuck. Machine turns the OD, forms the radius on the flange, and chamfers the bore on the coupling. Finished piece is automatically ejected, picked up by a safety finger, and dropped on an evacuation chute. Production of 450 pieces per hr is easily maintained. Machine cannot get out of time as all movements are controlled from cams revolving at the same speed as the main camshaft.

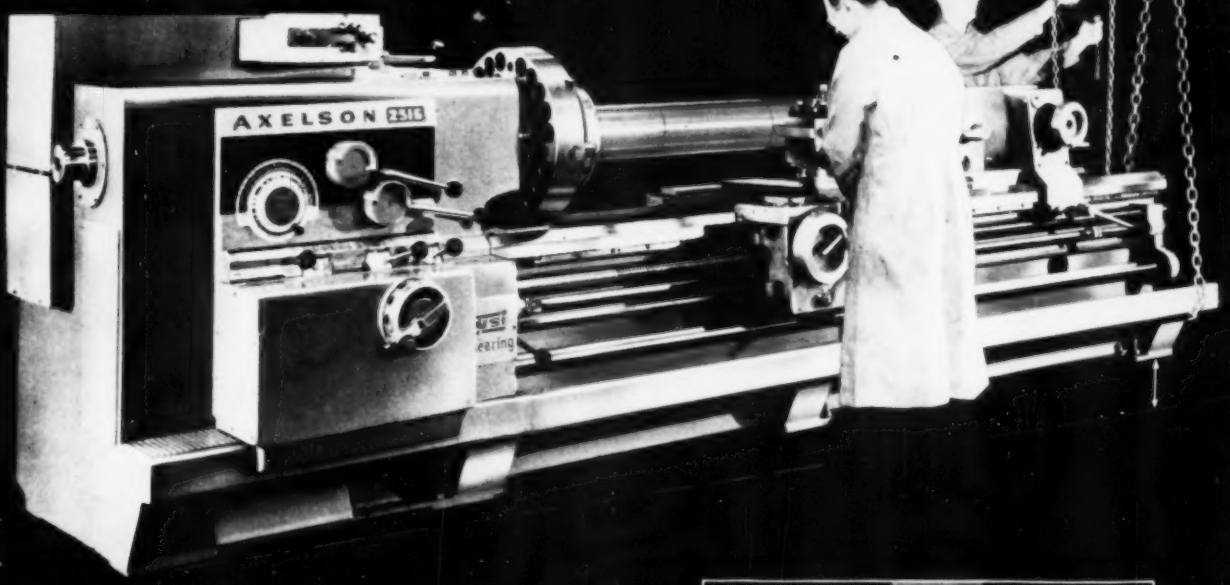
The IMP and automatic loader are designed for operations demanding high spindle speeds, fine finishes, and extreme accuracy. It is also suitable for turning heavier work such as small pistons, bushings, and gear blanks.

Seneca Falls Machine Co, 17 Fyfe Bldg, Seneca Falls, NY

MORE DATA? Circle 87, inside back cover

"There's a machine that thinks for itself."

WHAT DOES THIS STARTLING TEST MADE ON THE NEW CLEARING-AXELSON LATHE MEAN TO YOU?



In a recent demonstration before editors of the metalworking press, Clearing repeatedly raised and lowered one end of the Blue Chip lathe with an overhead crane—while the lathe was running. Accuracy on the ¾" cut in progress was held within .002" across the full length of the workpiece.

Certainly, you aren't going to operate a lathe with one end hanging from a crane. The test we made with the new Blue Chip lathe simply demonstrates the enormous rigidity of its all-steel bed. Why such rigidity? Demands placed on lathes by ceramic and sintered carbide tooling necessitates extreme stiffness and rugged construction in order to hold tolerances on heavy, high-speed cuts.

Here's What This Rugged Construction Means To You

Greatly Improved Tool Life—Reduced Breakage. Production Potential Unheard of With Conventional Equipment.

But there is more—much more—than just 18 times greater rigidity in the Blue Chip story: For all the facts write for the Clearing-Axelson Blue Chip Lathe catalog. We'll send it promptly. Clearing also distributes the Clearing-Harrison Lathe in sizes from 11" to 16".

Write for New Catalog on Blue Chip Lathe

USI Clearing

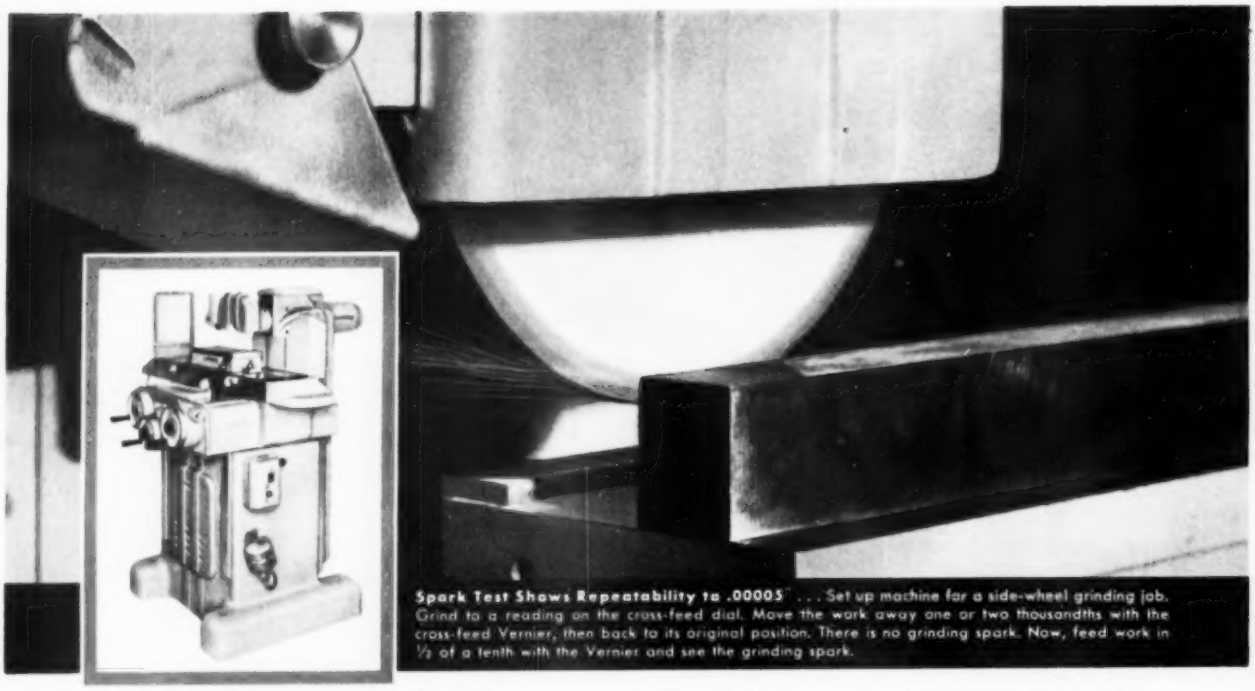
DIVISION OF U. S. INDUSTRIES, INC. 6499 W. 65th Street • Chicago 38, Illinois

PLANTS IN CHICAGO LOS ANGELES HAMILTON OHIO

CIRCLE 279 READER SERVICE CARD

FROM THE TAFT-PEIRCE METALWORKING FAMILY . . .

Two Unusual Grinders for Improving



Spark Test Shows Repeatability to .00005" . . . Set up machine for a side-wheel grinding job. Grind to a reading on the cross-feed dial. Move the work away one or two thousandths with the cross-feed Vernier, then back to its original position. There is no grinding spark. Now, feed work in ½ of a tenth with the Vernier and see the grinding spark.

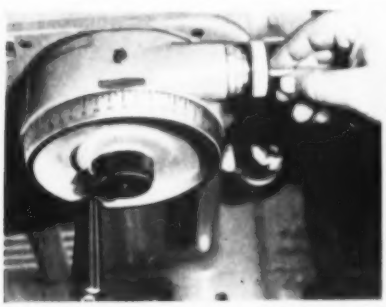
No. 1 Precision Surface Grinder Delivers Tenth-Splitting Accuracy, Low Micro-Inch Finish

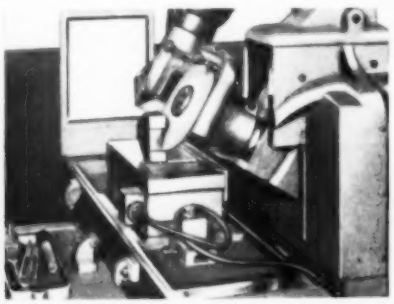
Here is a grinder that has proved itself to be one of the most precise and versatile tools any shop can own. It can produce a surface with extremely fine micro-inch finish . . . and operate with tenth-splitting accuracy on a day-in-day-out schedule.

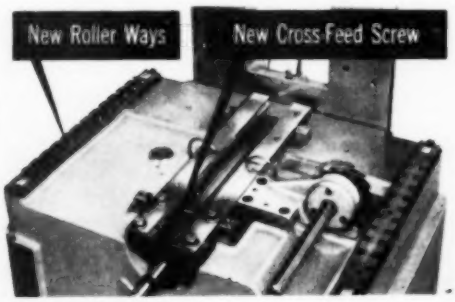
Sometimes hard to believe, this Taft-Peirce Surface Grinder produces surfaces of an accuracy, flatness, and finish formerly considered difficult or impossible to achieve. Experienced operators frequently grind to .00005", with surfaces so flat they wring . . . so smooth they seal without lapping.

The machine is extremely compact, but built to heavier and sturdier proportions than other machines of its class, with its pedestal and all supporting parts heavily ribbed for rigidity, stability and freedom from vibration. Ball mounted table, roller mounted saddle and ball tracked column, plus ball bearings throughout, provide extreme precision and uniformity of the parallel and rectilinear motions so indispensable to precision surface grinding.

See how the No. 1 Grinder can actually pay for itself in better quality, faster production of fine surfaces, and shop-wide versatility. Complete details from your Taft-Peirce Representative or write direct.







These Taft-Peirce features provide accuracy, versatility and long life . . .

Vernier Fine-Feed provides quick and exceedingly fine grinding control, with direct vernier readings to one ten-thousandth of an inch. Optional equipment for either cross-feed or vertical feed. **Exclusive Tilting Wheelhead** allows the spindle to swivel in a vertical plane through an arc of 30 degrees from horizontal. Ideal method to finish surfaces of slots, dovetails and undercuts. Grinding to sharp shoulders or corners is greatly simplified. **New Saddle Control** features improved Roller Ways and Anti-Backlash Cross-Feed Screw. Provides frictionless performance and greatly extended wear-life, plus positive setting and resetting accuracy.

Output, Quality and Finish

TAFT-PEIRCE 6″ Rotary Surface Grinder

This Taft-Peirce Rotary Grinder is designed to produce much finer surface finishes, which are flat within closer limits of tolerance, on the plane surfaces of gages, tools and small parts.

Two exclusive features provide unusual flexibility and accuracy:

- A Tilting Wheelhead permits swiveling of the entire spindle through an arc of 30 degrees from horizontal. This greatly simplifies grinding of shoulders and eliminates difficult and costly setups.
- Rotary Magnetic Chuck can be tilted 7½ degrees forward or toward the column (15 degrees total) for accurate resharpening and relieving of the edges of saws, cutters, and other tools.

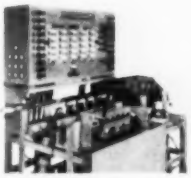
The Taft-Peirce 6″ Rotary has the same heavy-duty construction and offers the same tenth-splitting performance as the No. 1 Surface Grinder, giving every shop a multi-purpose tool for improving all types of surface finishing. It is available with Vernier Fine-Feed Attachment described on the opposite page; and with adapters for sharpening gear-shaper cutters.

SEND FOR MACHINE TOOL CATALOG NO. 317 . . . More details on these Taft-Peirce machine tools and their features and accessories are described in Catalog 317. Send for your copy.

TAFT-PEIRCE
Professional
CONTRACT MANUFACTURING
Designs, Develops, Produces Special Cost-Cutting Machinery

Taft-Peirce Contract Service includes extensive facilities for prototype design and development, toolmaking, machine design and building, and complete production and assembly of any product or device in the mechanical or electromechanical fields. Highly capable design and engineering personnel are available to carry your idea from inception through final production.

The Contract Service Division offers a completely independent and integrated facility which places at your disposal 450,000 square feet of manufacturing space and over 1500 modern machine tools.



Send for New Contract Facilities Catalog . . . Find out how Taft-Peirce can save you time and money, reduce capital investment and direct manufacturing costs, and provide skilled help and machine capacity overnight. Ask for Catalog No. 814.

TAKE IT TO TAFT-PEIRCE

13 MECHANIC AVENUE • WOONSOCKET, R.I.

Two-Stage Hydraulic Pump Has Dual-Volume, Dual-Pressure

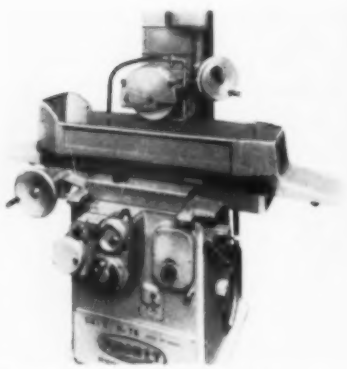
Hydraulic power package delivers from 600 cu in. of oil per minute at 100 psi to 50 cu in. a minute at 10,000 psi. The 45-lb unit's dimensions are 10¾ x 12⅝ x 17½ in. high.

New OTC Vanguard complete pumping unit, driven by a universal motor, consists of a gear pump for the low pressure stage and a 5-cylinder axial-piston pump, which is supercharged by the gear pump, for the high pressure stage. It makes full use of all available hp throughout the entire pressure range. Variety of valves, controls, and accessories are available and can be easily mounted to meet various specific requirements.

Reservoir capacity is 2 gal with 1¼ gal of usable oil. Common cover plate, on which pump, motor, and valving are mounted, makes possible the use of different size reservoirs. Vanguard suction head of 2½ ft permits pump to be used with a relatively deep reservoir such as an oil drum. Standard universal motor is 1⅛ hp 12,000 rpm 60/50 c, ac/dc. Motors can be mounted in any of four positions on the cover plate.

Owatonna Tool Co, North Cedar St, Owatonna, Minn

MORE DATA? Circle 88, inside back cover



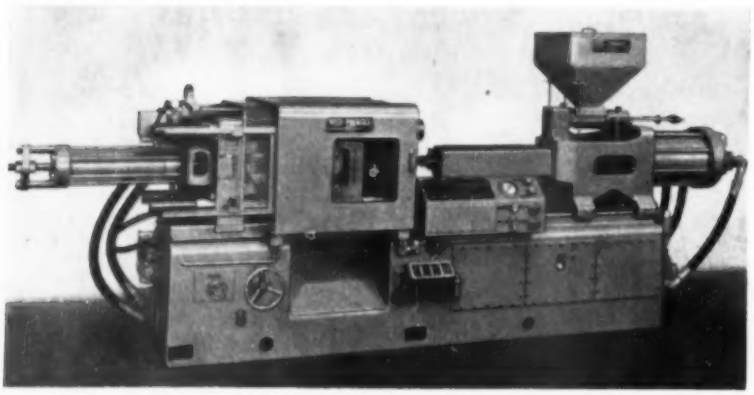
English Surface Grinder Has Centralized Finger-Tip Control

The Burdett precision surface grinder (English) features centralized fingertip control for instantaneous knock-off of table traverse and micrometer control of the downfeed handwheel.

Model No. 70 has a ¾ in. wide wheel and a 6 to 18 in. capacity. Model No. 75 has a 1 in. wheel and an 8 to 24 in. capacity. Table speed is 55 fpm.

Aaron Machinery Co, Inc, 45 Crosby St, NY 12, NY

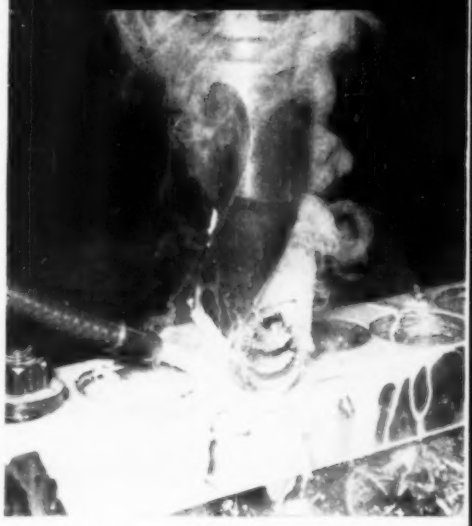
MORE DATA? Circle 89, inside back cover



PLASTIC INJECTION MOLDING MACHINE is able to handle molds as large as 27 x 15½-in. and can produce articles up to 5¾-in. deep. The model 275TA-8/10-oz machine develops 275 tons positive mechanical molding pressure and has a front safety door equipped with double limit switches and a hydraulic lock—*Reed Prentice Div., Package Machinery Co., East Longmeadow, Mass.*

MORE DATA? Circle 90, inside back cover

HEAVIEST CHIP ever made on a radial drill



Making the big chip. The illustration above shows a 3" HSS twist drill being driven in solid steel at 45 rpm with a .100" feed per revolution by a Cincinnati Bickford 19" column Chipmaster radial drill powered by a 25-hp motor.

Superior spindle construction. The spindle rides on a quadruple bank of preloaded precision bearings. It is driven by six splines; the total length of spline drive is in excess of 30". The ground spindle sleeve is supported in a 17½" long honed bore. You can't put too much thrust on this spindle!

Short, stubby column. Up to 17⅞" less height over column than other radials. Massive preloaded bearing construction. This column resists deflection to give you maximum rigidity for the heaviest drilling operations.

From base to spindle, the Chipmaster is a rugged machine. Get the facts—ask for literature; it's the only completely NEW DESIGNED radial available today.

the symbol for machining cost reduction

GIDDINGS & LEWIS

CIRCLE 282 READER SERVICE CARD

GIDDINGS & LEWIS

actual size chip made at .100" feed per revolution with a 3" twist drill driven in solid steel by the all-new Chipmaster radial drilling machine.

Spindle thrust: 20,000 lb!

Drilling the big chip illustrated at .100" feed per revolution put a 20,000 lb thrust on the spindle of the Cincinnati Bickford Chipmaster radial that did the job.

This demonstration emphasizes that the Chipmaster, more than any other radial drilling machine, provides a wider range of opportunities for greater profits and increased production.

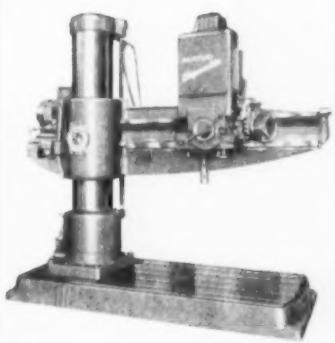
The exceptional thrust capacity, power, and rigidity of Chipmaster radials enable them to handle a wide range of heavy boring, facing, backfacing, spade drilling, and trepanning jobs.

Of equal importance, Chipmaster capabilities permit heavier feeds, higher speeds, or both on many of your jobs. The smooth delivery of power through the exclusive herringbone gear drive to the spindle allows you to take full advantage of carbide tooling, to do single-point boring, and precision tapping.

Optimum production is assured by 36 speeds in any of five ranges (speeds to 2300 rpm), 18 feeds from .004" to .125", and a choice of three ranges of geared positive tap leads.

Chipmaster radials are built in 13", 15", 17", and 19" column diameters. Three heads are available: mechanical shift, partial preselect (speeds only), or full preselect (both speeds and feeds).

If you are operating obsolete radials, ask your Cincinnati Bickford distributor to show you the big chip that proves the difference. Literature on request.



ALL-NEW CHIPMASTER®

the heavy-duty radial that does more than any before.

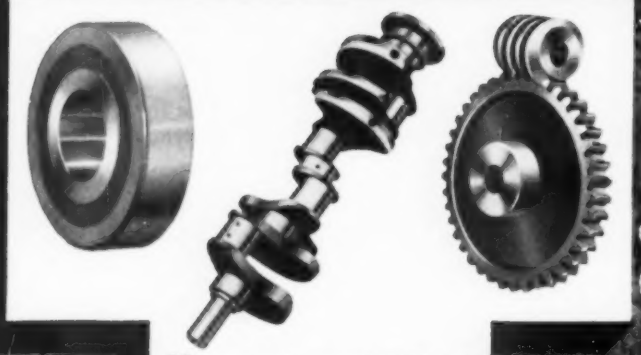
GIDDINGS & LEWIS MACHINE TOOL COMPANY

CINCINNATI BICKFORD DIVISION, Cincinnati, Ohio

Giddings & Lewis also manufactures: vertical and horizontal boring machines, vertical turret lathes, planers, planer mills, contour milling machines, die sinking machines, drilling machines, numerical and tracer control systems, boring tools and related items, and machine tool accessories.

CIRCLE 283 READER SERVICE CARD

VALVOLINE
Tectyl
protects metals against RUST



VALVOLINE'S amazing Tectyl rust preventives protect metal surfaces against *every kind of rust and corrosion* during storage and shipping.

Low-cost Tectyl compounds are easy to apply by brush, spray or dip and just as easy to remove. They protect metal surfaces against . . . sun and rain . . . heat and cold . . . salt air and salt water . . . humidity, perspiration and corrosive fumes.

Tectyl rust preventives meet exacting government specifications.

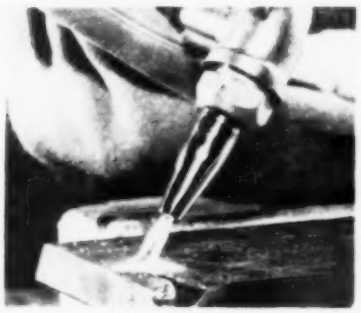
Write today for these two helpful Tectyl charts

1. "Valvoline Tectyl U. S. Government Approved Packaging and Preservative Chart." Gives the Army, Navy and Air Force "Specs" and applications.

2. "Valvoline Tectyl Industrial Rust Preventive Comparison Chart." Specifies applications covering the entire field.

VALVOLINE **Tectyl** ALL-METAL PROTECTION RUST PREVENTIVES

VALVOLINE OIL COMPANY, Freedom, Pennsylvania



Improved Nozzles Boost Flame-Cutting Speeds

Improved nozzles for use with acetylene or fuel gases are said to boost flame cutting speeds. Included are nozzles for riser removal, fin washing, general duty cutting, and high-speed mechanized shape cutting.

Series 1534 and 1535 Oxweld two-piece nozzles, for use with natural gas, have 12 to 20 extremely small outlets for uniform preheat, and a divergent nozzle bore design that increases exit speed of the gases by 20%.

Oxweld 1523 and 1524 series nozzles, designed without spuds and with a deeply recessed cutting oxygen bore, are said to double rates of metal removal in fin washing operations.

Series 1540 bendable nozzles for riser removal and hard-to-get-at places are 10-in. long and have 10 preheat outlets. Series 1539 nozzles produce a low-velocity oxygen stream and are said to remove rivet heads twice as fast as ordinary nozzles.

Linde Co, Div of Union Carbide Corp, 30 E 42nd St, NY 17, NY

MORE DATA? Circle 91, inside back cover

"Jehosaphat, Wentworth, when I said you had the seniority to 'bump' Furguson off his job— I didn't mean . . ."

Kaiser Aluminum doubles capacity with new Bliss hydraulics

Unusual control system provides broad job shop work range in both hand and closed die forging ... This 8,000-ton Bliss Hydro-Dynamic* press, together with similar 3,000-ton and 5,000-ton presses, are the key units in the recently completed $5 million press department at Kaiser Aluminum & Chemical Corporation's Erie, Pa., plant. The presses have doubled Kaiser Aluminum's capacity to produce a broad range of aluminum forgings for commercial applications, as well as for aircraft and missile components.

In spite of their size, the presses have unusual flexibility: the multiple cylinder design of the two larger units and novel automatic control systems provide precise, stroke-after-stroke regularity of forging speed and pressure.

What's your press need? In everything from bench presses to giant hydraulics, you'll find the greatest reliability ... and the most advanced engineering ... in a Bliss.

*Registered trademark E. W. Bliss Company

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PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CONTAINER MACHINERY • CONTRACT MFG.

CIRCLE 285 READER SERVICE CARD

Bearings, Inc. now offers a new and improved RETAINING RING ECON KIT

400 Truarc Cadmium Plated Rings
– 84 Sizes – 70% of Ring Sizes Used in Industry

Save — eliminate many purchase orders for small quantities of retaining rings — Get most sizes used on your equipment with only ONE order — in one shockproof, plastic case. Sizes from ¼ to 2½ inches in the three most used Truarc series of internal, external and universal crescent ring designs. All rings meet National Aircraft Standards NAS 669 and NAS 670. Low priced at $34.50 per kit. Use the coupon below TODAY!

Installation and removal tools also available.

BEARINGS, INC. • 3634 Euclid Avenue • Cleveland 15, Ohio
Gentlemen:
Please ship immediately_____Retaining Ring Kits at $34.50 each.
Company_____
Address_____
Signed_____ Title_____

Providing bearing service in the North

BEARINGS, INC.
MAIN OFFICE: 3634 Euclid Avenue, Cleveland 15, Ohio

and in the South

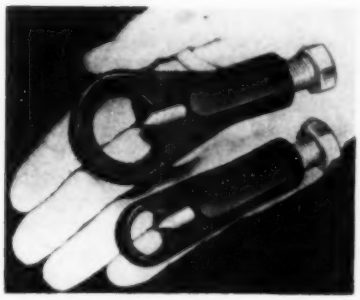
DIXIE BEARINGS, INC.
MAIN OFFICE: 276 Memorial Drive, SW, Atlanta, Georgia

Drill Adapter Provides Finger-Tip Pressure Control

Stanley Drill Adapter provides a highly sensitive hand feed for delicate drilling, permits quick set-ups, and allows the use of big machines for drilling holes ranging from 0.005 to 5/32 in. The attachment gives approximately $\frac{3}{4}$-in. additional depth control by raising and lowering the drill point according to the fingertip pressure on a feed ring.

H C Stanley, 316 West Sierra Madre, Glendora, Calif

MORE DATA? Circle 92, inside back cover



Tool Splits Frozen Nuts Without Damaging Bolts

Three-piece kit is designed to split rusted or frozen nuts without damaging bolt or threads. Kit consists of a chrome-moly tool steel cutter and two cast steel frames with hex shafts, measuring $3\frac{1}{4}$ in. with $\frac{3}{4}$-in. opening and 4 in. with 1 3/16-in. opening. Cutter can be used on as many as 100 nuts without re-sharpening. Cost of kit with plastic case is $8.95.

Borroughs Tool and Equipment Corp, 2429 N Burdick St, Kalamazoo, Mich

MORE DATA? Circle 93, inside back cover

CORRECTION—The address of the Bosworth Mfg Co, manufacturer of the machine-side conveyor line described on page 172 of the June 15th issue, was incorrectly listed as Avon, Conn. It should be Avon, Ohio.

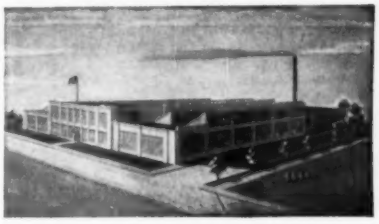
3 ways CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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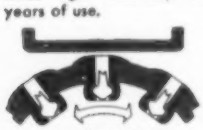
"POP" RIVETS

Insert and Set From Same Side
Cuts installation costs in half.

High Clinching Action
Pulls parts together with up to 600 lbs. squeeze. Eliminates need to clamp.

Wide Grip Range
Simplifies inventory, purchasing, inspection. Same length "POP" Rivet holds tight through thick or thin.

Vibration Proof
"POP" Rivets cannot back out or become loose. Ensures tight assembly for years of use.



Low Head Profile
Where space is important, "POP" Rivets' minimum head height eliminates clearance problems and improves appearance.

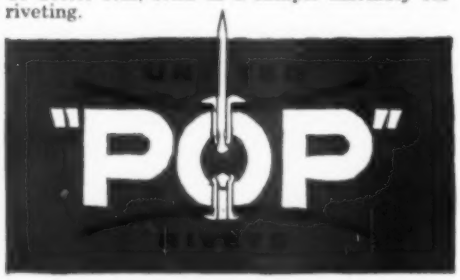
Least Back-Up Space
Strong, high strength "POP" Rivets need only enough back-up space to provide room for set head. Gives more compact design.

- **Cut Assembly Costs**
- **Solve Design Problems**
- **Installed and set from same side**

"POP"® Rivets cut *installed fastener costs*, add design flexibility, and increase assembly convenience because they are inserted and set from the same side. Up to 1200 can be set per hour right on the assembly line — even by an unskilled operator.

"POP" Rivets are precision made, hollow rivets assembled on a solid high tensile mandrel. The setting tool pulls the mandrel head into the rivet from the front side, setting the rivet on the reverse side. Mandrel breaks under tension of up to 1600 lbs. and falls free.

You can cut installed costs, increase assembly convenience, and secure high speed, trouble-free fastening immediately with "POP" Rivets. No need for complicated or extensive re-tooling. Simplify product design, cut handling time. Call or write us today — now! — and start cutting your *installed fastener costs* with "POP" Rivets! Or better still, send us a sample assembly for riveting.



"POP" RIVET DIVISION
UNITED SHOE MACHINERY CORPORATION

FIELD REPORT...

Canadian Firm Formed to Supply Aluminum to Chrysler Corp

Chrysler Corp of Canada, Ltd, and Aluminum Co of Canada, Ltd, an Aluminum subsidiary, are setting up a new company which will supply aluminum ingots both to Chrysler of Canada and to Chrysler Corp plants in the US. Firm, to be called Chryslum, Ltd, will lease the Alcan smelter at Beauharnois, Que. Alcan will continue to operate the smelter, which has a capacity of 36,000 tons of ingots a year, for Chryslum. Chrysler of Canada will have a majority interest in the new company; ingots sold by Chryslum to Chrysler in this country will be sold at the US market price. The US company reports that it will continue to buy aluminum from domestic producers also. Neither company has said how much of Chrysler's US requirements will be met by Chryslum. Ingots bought in Canada, however, will be used in operations at Kokomo, Ind, company's biggest aluminum die-casting facility.

Cutler-Hammer Unit Heads Team Working on $38 Million Contract

Airborne Instruments Laboratory, a division of Cutler-Hammer, Inc, Mineola, NY, has a $38.9 million AF contract for development and design of airborne electronic equipment. AIL heads up an eight-member team of participating companies, and will manage the group.

Equipment involved is reportedly an "all purpose" interchangeable reconnaissance system that can be used by many types of planes and missiles. It would consist of a series of "black boxes" which could be

"Just ring in! Don't bother to tell us every time you get here, Hoskins!"

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Get your share and keep it there!

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MAKES THE BEST PRODUCT BETTER

Threadwell's fine line of cutting tools and gages is one guarantee of uninterrupted production, the surest way to stay in a competitive position.

To get out front and stay there make sure you include your Threadwell Distributor in your production planning.

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GREENFIELD, MASSACHUSETTS

Stocking Warehouses: New York — Cleveland
Detroit — Los Angeles — Greenfield, Mass.

ULTRASONIC BREAKTHROUGH!

ONLY ACOUSTICA ULTRASONIC CLEANERS HAVE MULTIPOWER!

The Multipower transducer developed by Acoustica research, multiplies the power and efficiency of ultrasonic action. Cleaning is faster, better, labor costs are lower. Acoustica ultrasonic cleaners are built for performance and durability. They are engineered to the finest standards, unequaled in quality and value.

Off-the-shelf in capacities from 1 to 75 gal. or custom built to 5000 gal. and more. Expert Acoustica engineers can help you with your cleaning problems. Send for further information.

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Send information describing advantages of Acoustica ultrasonic cleaners.

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Field Report . . .

switched about according to the mission involved; redesigning or tailoring for each vehicle would be reduced to a minimum. Following completion of the prototype equipment in the 36-month program (nearly 12 months of work is believed to have been done already) it's reported there will be substantial production contracts running very much larger than the present development contract.

In addition to AIL, team consists of Sperry Gyroscope Co, a division of Sperry Rand Co; Sylvania Electric Products division of General Telephone & Electronics Corp; Raytheon Co; Haller, Raymond & Brown, Inc; Temco Corp; Filtron Co; and Aerojet-General Corp, a subsidiary of General Tire & Rubber Co.

US Chemical Milling Buys H & B Aircraft Division

United States Chemical Milling Corp, headquartered in Manhattan Beach, Calif, has purchased the aircraft division of H & B American Machine Co, Chicago. Newly acquired facilities will be known as the American Machine Division of USCM.

Columbium Alloy Turbine Blades

First forged jet engine turbine blades ever made from a columbium alloy have been shipped by the Tapco Group of Thompson Ramo Wooldridge Inc, Cleveland, to a major jet engine manufacturer for an engine now under development An argon atmosphere for heating processes and special lubricants engi-

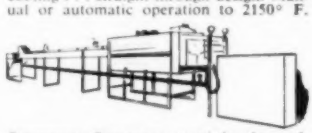
"Would you do a little job for me Newton?"

ED JOHNSON
Furnace Application Engineer, reports . . .

SINTERING GOES SCIENTIFIC

The effective bonding of powder metal compacts is dependent on precise sintering temperatures, and the properly reactive furnace atmosphere for each temperature range. To assure optimum results at lowest cost, Hayes offers both the *right* furnace and the *right* atmosphere for any sintering operation, whether you're working with ferrous, nonferrous, or refractory metals; stainless steel compacts; or cermets. Hayes furnaces and atmospheres suitable for research, high-temperature, or production sintering, include:

Type BA-M Pusher "Pilot Plant" Furnace. Controlled atmosphere heating and cooling . . . straight-through design. Manual or automatic operation to 2150° F.



Conveyor Furnaces straight-through LAC and Humpback BAC — for continuous, automatic, sintering to 2100° F. Zone temp control. Burn-off sections. For stainless steel, etc.

Type BA High-Speed Pusher Furnace — wide-temperature-range furnace for sintering to 2350° F. Available with automatic, electro-hydraulic pusher system for constant time / temperature cycles.

Type M-Y High-Temperature Furnace for uniform heating of ceramic and metal compacts at temps over 3000° F. Economical — use with reducing atmospheres for close-control research or full-scale production.

Model HT HV Vacuum Furnace for high vacuum (0.1 micron), high temperature (3000° F plus) sintering special refractory metals—titanium, zirconium, tungsten, etc. High-speed heating and cooling cycles. Cold wall design, low voltage elements.

Atmosphere Equipment . . . ammonia dissociators; endothermic, exothermic, nitrogen, forming gas generators; Molecu-Dryers for drying protective atmospheres to —100° F D.P. Designed for controlled, dependable operation.

Use Hayes experience and equipment to insure a "Results Guaranteed" solution to *your* heat treating or protective atmosphere problem—to improve your product, reduce spoilage, or speed up production. Write for details.

C. I. HAYES, INC.
Established 1905
37 WELLINGTON AVE. • CRANSTON 10, R. I.

It pays to see HAYES for metallurgical guidance, lab. facilities, furnaces, atmos. generators, gas and fluid dryers.

Completely Satisfactory in Every Way

. . . says Mr. William H. Vogt, Division Superintendent of Parts and Tool Manufacturing at Taylor Instrument Companies, Rochester, N. Y.

NEW TYPE D Hand Feed SURFACE GRINDER

is ruggedly designed for precision work.

Taylor Instrument Companies

95 AMES STREET
ROCHESTER 1 N.Y. U.S.A.
May 7, 1959

Mr. John C. Wilson,
Vice-President, Sales & Engineering
The Thompson Grinder Company
Springfield, Ohio

Subject: THOMPSON Type D Surface Grinder

Dear John:

We have proven the new Thompson Type D Tool Room Grinder by rigid tests in our Tool Grinding Department. We find it completely satisfactory in every way.

We find these decided advantages on the new Thompson:

1. Its ease of adjustment
2. Its ruggedness and rigidity
3. Its bedway and column protection
4. Its large vertical capacity
5. Its cross-feed movement obtained by moving the wheel head rather than using a saddle, which permits accurate grinding of slots.

Everything considered, we find, in our work, the new Thompson Type D a very superior precision machine.

Yours very truly,

William H. Vogt

William H. Vogt
Division Superintendent
Parts and Tool Manufacturing

whv:lb

With men like Mr. Vogt, who rate tool room grinders solely on their performance, Thompson's new Type D machine is winning enthusiastic approval.

Send for descriptive literature on this new Type D machine and compare the advantages it offers you in cost-cutting time-saving and trouble-free performance. Immediate delivery is available.

"Keep Thompson in mind for that daily grind"

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO.

SPRINGFIELD, OHIO

CIRCLE 292 READER SERVICE CARD

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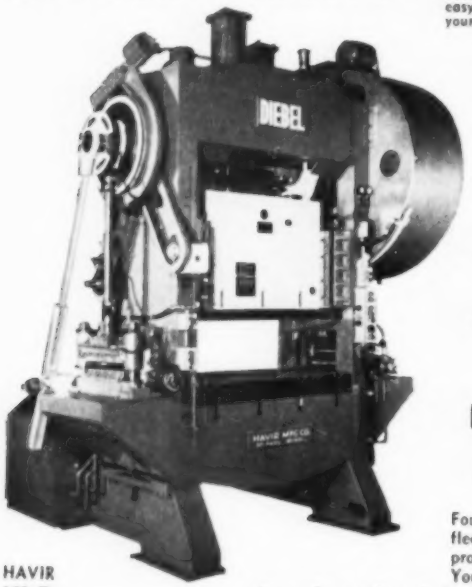
This HAVIR Profit Plotter makes it easy to compare your costs with the cost of the same job on the right HAVIR Press. Write for your copy TODAY.



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150 Ton
Wide Bed

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Stamp your way to BIGGER PROFITS with HAVIR

(formerly DIEBEL)

HI-PRODUCTION AUTOMATIC PRESSES

Four post frame design eliminates deflection, exclusive cylindrical type ram provides maximum bearing surface. You get more pieces per die sharpening, reduce unit costs to a minimum. Models from 5 to 150 Tons with many standard and optional features.

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FOR GREATER PRODUCTION • EFFICIENCY • SAVINGS

Use rugged, reliable "Hole Hog" machine tools for such jobs as:

★ Multi-Spindle Boring ★ Single and Multi-Spindle Honing
★ Straight Line Multi-Drilling ★ Adjustable Spindle Drilling
★ Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
★ Special Multiple Operation Machine Tools

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown)

Over 58 years of MachineTool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL COMPANY
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REPRESENTATIVES IN PRINCIPAL CITIES

Field Report . . .

neered by the Tapco Group were used to precision-forge the airfoils. Process produces airfoil shapes of such dimensional accuracy that only polishing operations are reported necessary to finish them.

MPB Research Center

Miniature Precision Bearings, Inc, is constructing a half-million-dollar research center next to its production plant at Keene, NH. Facility will develop new approaches to precision bearing design and applications, and new equipment to improve manufacturing techniques. Facilities will also be provided for manufacture of new products. Company expects to begin occupying the new quarters by late summer.

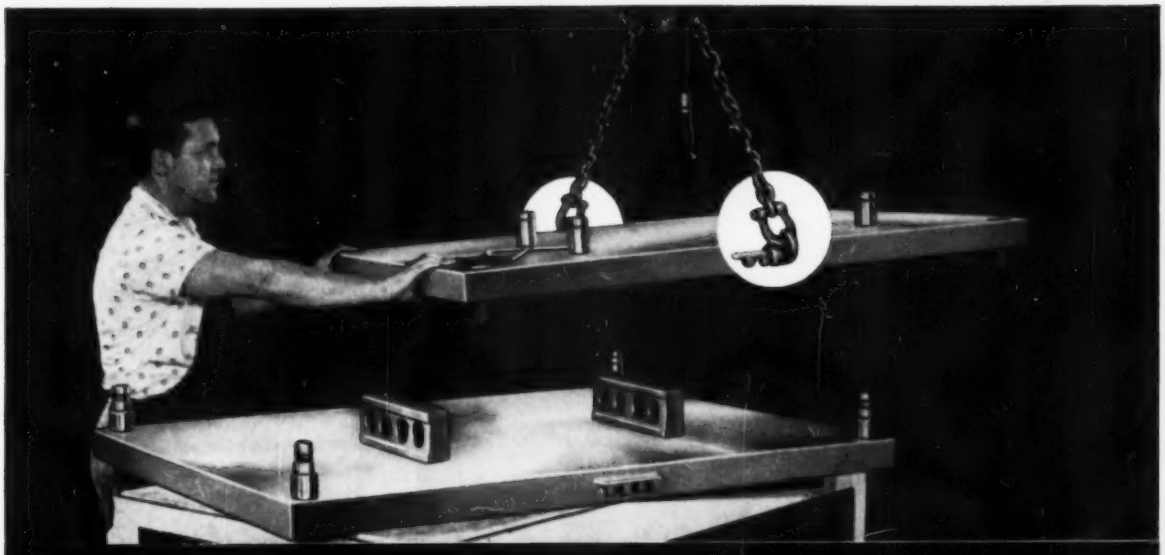
Raytheon Mfg Co's . . .

. . . missile production plant at Bristol, Tenn, is dropping 300 to 500 employees from its current workforce of 2215. Cut has been made necessary because of decrease in Navy orders for the Sparrow II missile.

Clark Equipment Co Forms Hydraulic Products Division

Clark's new division in Benton Harbor, Mich, will manufacture hydraulic pumps, motors, valves, and related products. It'll turn out hydraulic systems for Clark's own lines of materials handling equipment and construction machinery and will serve also as a source of supply for other original equipment manufacturers. Division is now in production

"After 18 years at that machine, Gordon suddenly refuses to continue work unless we tell him what he's making."



LIFT and TURN LARGE and SMALL DIE SETS, QUICKLY, SAFELY

with **SUPERIOR**

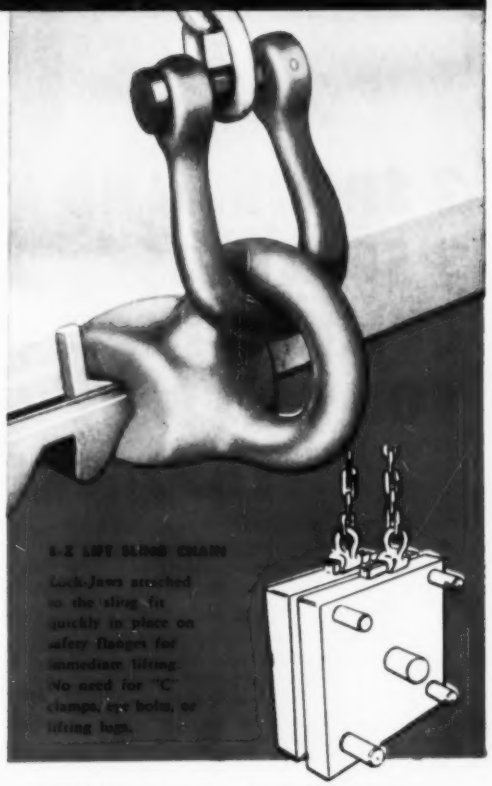
LOCK JAW LIFTING DEVICE

Superior's LOCK-JAW is a simple, self-locking wedge that teams with the patented Superior Safety Flanges to permit one man to lift and turn larger sets in minutes — with positive protection for costly dies and human life and limb.

The tendency toward careless blocking is removed when LOCK-JAWS make it so simple, safe and easy.

One of the many exclusive safety and handling features offered ONLY on Superior Die Sets.

Write or Call for your free 28 page catalog.


E-Z LIFT SLING CHAIN
Lock-Jaws attached to the sling fit quickly in place on safety flanges for immediate lifting. No need for "C" clamps, eye bolts, or lifting lugs.

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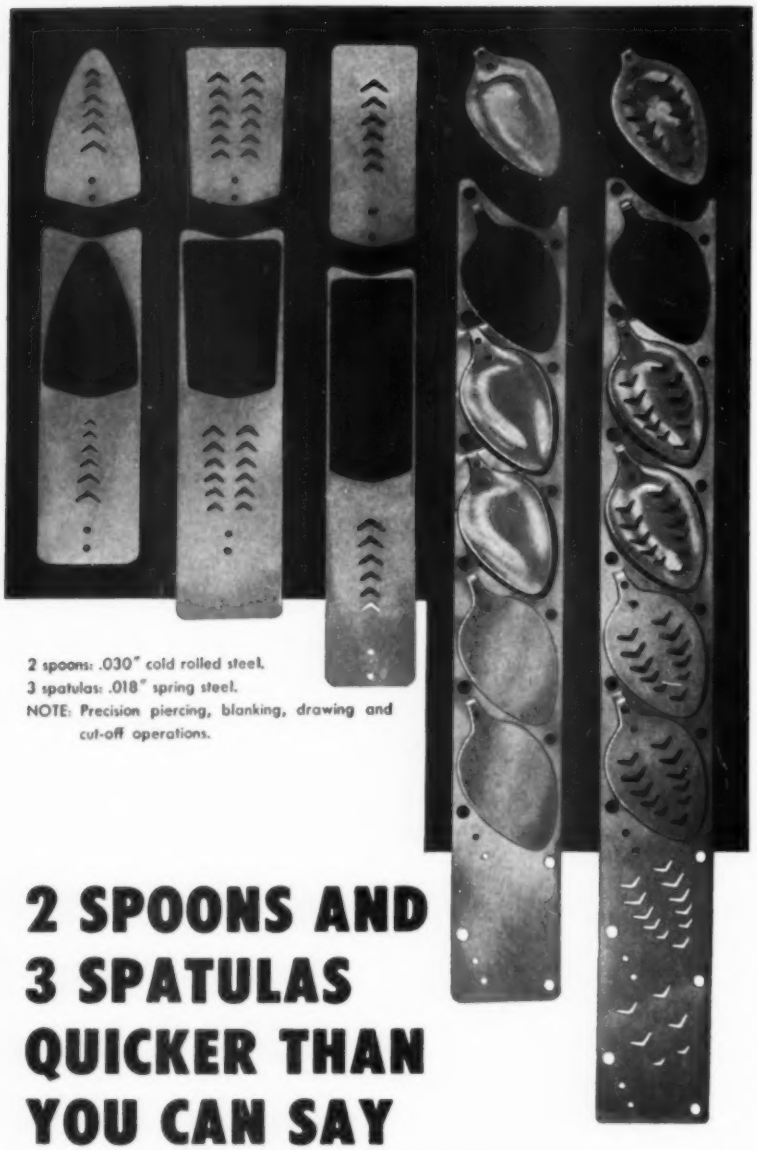


2 spoons: .030" cold rolled steel.
3 spatulas: .018" spring steel.
NOTE: Precision piercing, blanking, drawing and cut-off operations.

2 SPOONS AND 3 SPATULAS QUICKER THAN YOU CAN SAY "FLAPJACK!"

Precision mass production of mixing spoons and spatulas—modern designs for modern homemakers—products of B. Jahn "Production Proved" Progressive Dies.

One of America's foremost kitchen tool manufacturers entrusted these five dies to B. Jahn because "nothing is too good for their customers." The result, dependable trouble-free tooling, a superior product, exceptional production speed and economy.

If your product is mass produced...

If "nothing is too good for your customers"...

If dependable production and competitive economy is desirable...

B. Jahn is your source for production speed, economy and tooling ingenuity.

B. Jahn

Send for colorful "Case History" Brochure

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Field Report . . .

on pumps in capacities from 4 to 150 gpm and hydraulic motors up to 50 hp. Complete valve line in capacities up to 150 gpm will be in the works soon. Approximately 60% of first year's production will be used by Clark; 40% will be sold to other companies.

Dana Buys Rzeppa Joints

Dana Corp of Toledo has acquired the Rzeppa constant velocity universal joint assets of Gear Grinding Machine Co of Detroit. Rzeppa will remain in Detroit and operate as a separate division of Dana.

Philco Computer Center

Construction of Philco Corp's new multi-million-dollar Transac computer center is underway on a 72-acre tract of land near Willow Grove, Penna. Plant, with more than 200,000 sq ft of floor space, will house research, engineering, and manufacturing facilities for producing the Transac S-2000 large scale electronic data processing system and Philco's industrial process control and mobile field computers for the military. Company expects to be in the new plant by early November.

New Company Formed to Handle Colonial Broach Products

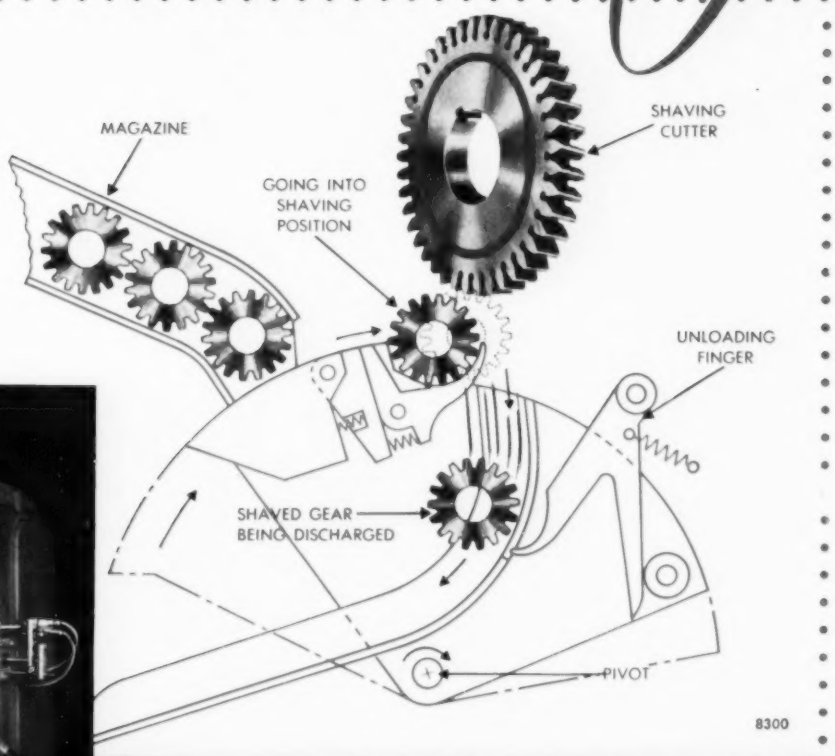
New sales engineering organization, the D E Miller Co, has been established to represent the various product lines of Colonial Broach & Machine Co, Detroit, and its divisions, in the Pontiac, Flint, Ann Arbor, Jackson, Saginaw, and Lansing areas

"Oh boy—going-to-work time—at last!"

WHY SETTLE FOR ONLY **75%**

OF THE PRODUCTION YOU CAN GET WITH

AUTOMATIC GEAR SHAVING



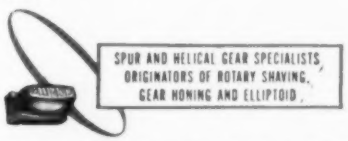
RED RING ROCKER-TYPE AUTOMATIC LOADER
(PATENTED)

Production you can expect from automated gear shaving is determined by the type of automatic loader you use.

You get maximum production when the loader moves a gear from the magazine into shaving position and discharges its shaved predecessor — **all at the same time.** This assures maximum cutter operation.

If, on the other hand, the loading of a fresh gear has to wait until the previous gear has been discharged, shaving is delayed and you get only about 75% of the production you could otherwise expect.

The standard Universal Red Ring Gear Shaving Machine may be automated for MAXIMUM PRODUCTION — and without any major revisions in its design. Write for details.



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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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AUTOMATIC POSITIONING

with the

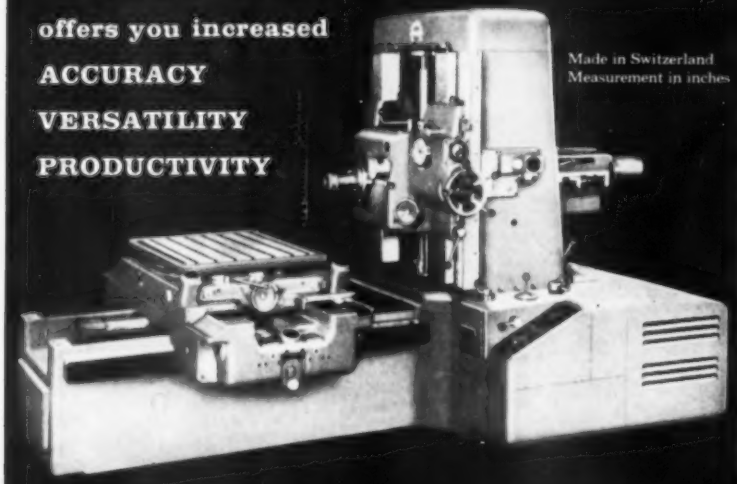
DIXI 75 horizontal optical jig borer

offers you increased

ACCURACY

VERSATILITY

PRODUCTIVITY



Made in Switzerland
Measurement in inches

- Automatic positioning can be changed instantly to manual operation
- Projected optical setting — direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

MBI

M. B. I. EXPORT & IMPORT LTD.

A DIVISION OF MACHINERY BUILDERS, INC.

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"Over 25 years' experience in designing and building machinery."

Field Report . . .

as well as in the northern portion of the lower Michigan peninsula. Formed by Don Miller, sales manager for the past three years of Chrysler Corp's Mound Road Engine plant, new company will be headquartered in Pontiac, Mich.

Monogram Precision Industries . . .

. . . Culver City, Calif, has obtained exclusive rights to engineer, manufacture, and market a new type of metal sandwich structure, known as Pelcor, for use in high speed jet and space craft. Company acquired the rights from Fabricated Structures Co, and bought the assets and equipment from Pelham Corp, both headed by Orvil S Tuttle, inventor of the new Pelcor process, who will become technical director of Monogram. Initial phases of production will be the building of various test panels on contract.

ACF Plant Gets $3 Million Job

American Car & Foundry Div of ACF Industries has a $3.2 million contract to produce 8-in. shells. Contract will not increase employment at the Berwick, Penna, plant, but will mean continued work through next April.

Rheem Semiconductor Corp. . . .

. . . subsidiary of Rheem Mfg Co, is putting up a $1.5 million facility in Mountain View, Calif. The 100,000 sq-ft plant will turn out semiconductor components for computers; employment is expected to reach 1500 by the end of 1960. The currently occupied building will be given over

(Continued on p189)

"There's no hurry getting that machine working again. Any time today will be all right."

CIRCLE 298 READER SERVICE CARD

CIRCLE 299 READER SERVICE CARD ►

This Standard Oil product made better grinding possible at Cessna

Aircraft Company's Industrial Products Division licked three problems with ARGON Oil No. 4

Situation: A fluid used in grinding operations at this Cessna plant at Hutchinson, Kansas, was creating three problems:

1) It washed the lubricant from regulator wheels and grinding fixtures, causing them to freeze.
2) It caused build-up of deposits.
3) It stripped paint from machine surfaces.

What was done: Cessna management called in a Standard Oil lubrication specialist who recommended ARGON Oil No. 4 in ratios of 100 and 150:1 for test. The coolant was tested in two centerless grinders for two months.

What happened: All three conditions which were hampering operations were cleared up when the switch was made to ARGON Oil No. 4. Cessna also found that work remained rust-free after passing through the machines, something that had not been the case before. They also found that the coolant didn't foam. With no foam, more of it stayed on the wheel, resulting in cooler operation. Faster cuts were obtained with finer wheels. All 12 grinders in the Cessna shop were then converted to ARGON Oil No. 4.

What you can do: Get more facts about ARGON Oil No. 4 from the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

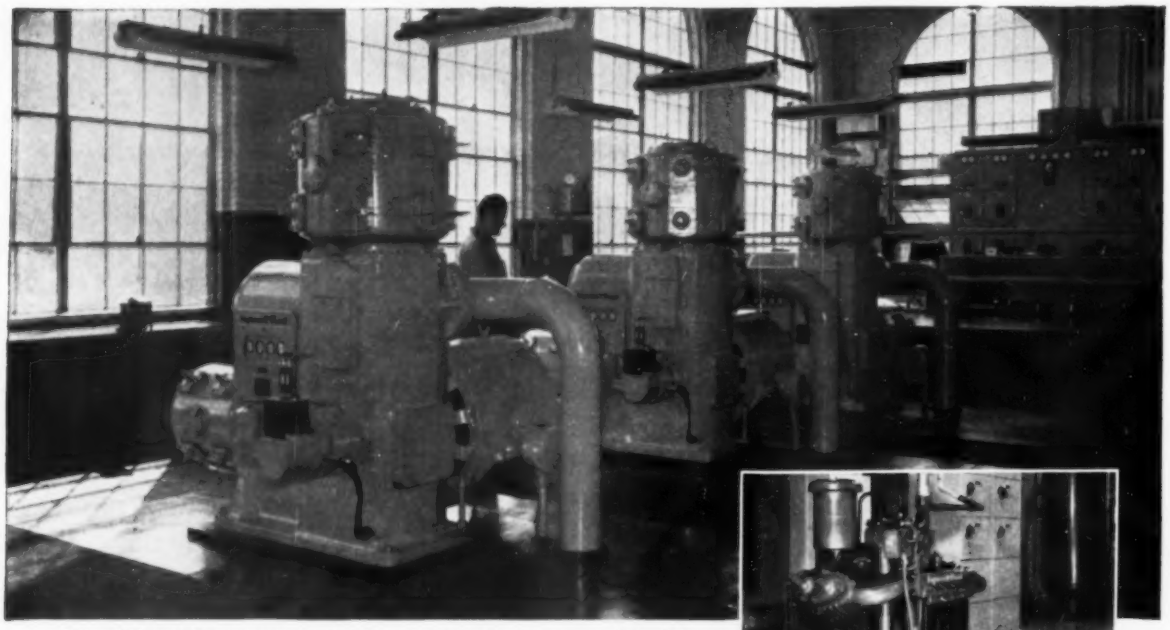
Quick facts about **ARGON Oil No. 4**

• Clear, transparent fluid • Able to control corrosion and rust on work and machines • All chemical. Does not support bacteria growth • Unaffected by humidity • Fire resistant • Odorless

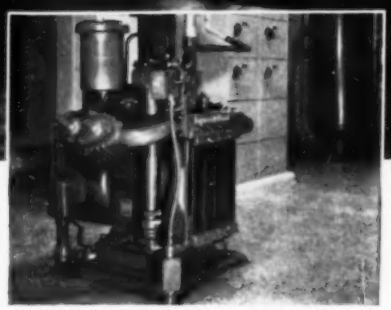
Jerry Croes, Standard Oil staff engineer, Paul Hoyer, Cessna section superintendent and Bill Ray, Standard Oil lubrication specialist (l. to r.) inspect rust-free finish after grinding with ARGON Oil No. 4 while J. E. Petrie (far left), operator, looks on. Both Jerry Croes and Bill Ray have plenty of experience in this sort of work. Jerry has been at it for 16 years. He has an engineering degree from South Dakota School of Mines & Technology and has completed the Standard Oil Sales Engineering School. Bill has six years service working with industrial customers.

You expect more from **STANDARD** *and you get it!*

How to squeeze more profits out of your COMPRESSED AIR POWER



Three 125-hp XLE compressors generating air power for a weapons plant. This compact two-stage unit features pipeless Thru-Frame air flow and full-floating aluminum bearings which never need adjustment. Sizes 125 to 350 hp. (Other I-R air compressors to 4000 hp.)



This air-cooled two-stage Type 40 compressor is one of several furnishing plant air and instrument air in a power plant. Sizes 25 to 125 hp. (Others from ½ hp.)

Make sure you have enough pressure at point of use—and extra dependability at point of generation

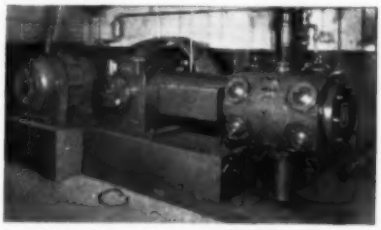
Cost-conscious plant engineers and production men know that to get the full savings inherent with air-powered equipment, you must have full air pressure at every tool.

But it's equally important to guard against unscheduled shutdowns where your air power is generated. This problem can best be solved at the time of purchase, by specifying compressors that have an extra margin of safety against mechanical troubles.

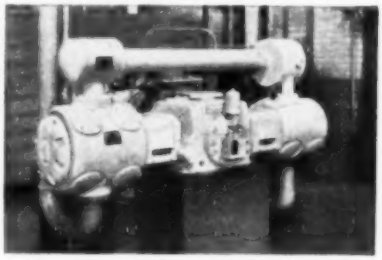
Ingersoll-Rand compressors have that extra safety margin built in. They'll stay on the job longer, with minimum attention and maintenance. Take valves, for example—the most "vulnerable" point in any compressor. Only I-R compressors have Channel Valves, known the world over for efficiency, quiet operation and long life. Their exclusive air-cushioned action eliminates impact and greatly reduces wear.

Also in I-R compressors, all running parts are sealed against dust and dirt which might cause wear. The seal need never be broken, since bearings are a type which will never need adjustment.

For top compressor performance and long-run economy, specify Ingersoll-Rand. And ask your I-R representative to show you how to get your maximum *"Dividend on Payroll Dollars"* with a Planned Annual Review of your air power system.



Ingersoll-Rand's new ESH horizontal compressor, here in a tool factory. Sizes 20 to 150 hp. Also built as vertical unit, called ESV.



Two-stage balanced-opposed PHE compressor handling air in a gas plant. Also built as L-design unit with packaged intercooler. Sizes 75 and 100 hp.

Ingersoll-Rand

I-9156

11 Broadway, New York 4, N. Y.

COMPRESSORS · GAS & DIESEL ENGINES · PUMPS · AIR & ELECTRIC TOOLS · CONDENSERS · VACUUM EQUIPMENT · ROCK DRILLS

Field Report . . .

entirely to semiconductor research when the new facility is completed next February.

$3.5 Million AF Order Goes to Ward La France

Contract for construction of 90 tow-tractors for use in connection with B52 bomber aircraft has gone to Ward La France Truck Corp, Elmira, NY. Production work is starting immediately and it's expected that 200 additional workers will be hired during the next six months. Delivery of the first units will be made in September.

Vermont Tap & Die Co . . .

. . . has bought the Hommel Corp, Grove City, Penna, manufacturer of powered screwdriver bits. Machinery and equipment for producing the bits are being moved to the Vermont plant in Lyndonville, Vt.

American Electronics Contracts

American Electronics, Inc, Los Angeles, has received $9 million in orders to produce ground support equipment for Convair's F-106 jet interceptor. Contracts boost American's backlog to more than $16 million from $11 million a year ago and $7.5 million at the beginning of 1959. Major portion of deliveries is expected to be made within the year.

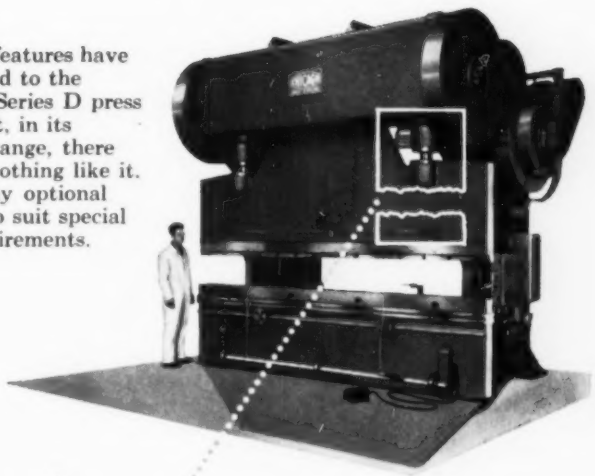
Ford's Aeronutronic Systems Merging With Parent Company

Ford Motor Co is merging its southern Calif subsidiary, Aeronutronic Systems, Inc, with the parent company. Called Ford's "space age subsidiary," Aeronutronic is presently

"All you asked for was a bigger pay envelope, as I recall!"

IN FEATURE
AFTER FEATURE
there's nothing like it

So many features have been added to the CHICAGO Series D press brake that, in its capacity range, there really is nothing like it. Also, many optional features to suit special work requirements.



features for

Operating Conveniences to Save Time and Money
Unexcelled Accuracy
Quiet, Smooth Running
Operator's Safety and Machine Protection
Superior Production Performance

Here's one of the operating conveniences: the ram adjustment control with OPEN-UP-DOWN push-button station (110-volt operation) and the counter-type indicators for left and right-hand adjustment screws close together in convenient view of operator. Think of the effort and set-up time saved with this exclusive adjustment control.

The advanced design CHICAGO Series D press brakes are described in bulletin D-59. Ask for a copy.

9087

A Tradition of Quality and Value since 1899

Press Brakes • Press Brake Dies
Straight-Side-Type Presses
Hand and Power Bending Brakes
Special Metal-Forming Machines

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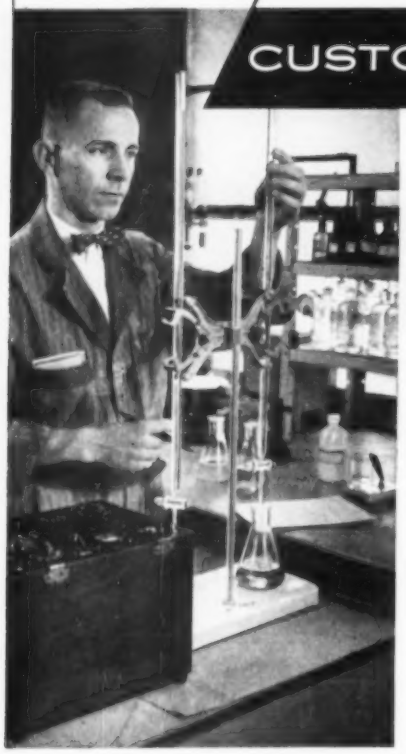
consult the.... Roto-Finish

CUSTOMER'S MAN



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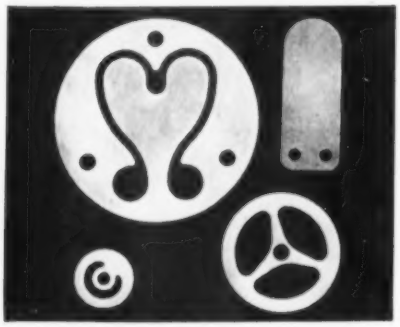
RESEARCH AND TECHNICAL ASSISTANCE

Faced with the problem of cutting down finishing costs with no sacrifice in product quality, more and more production and management men are turning to Roto-Finish for complete finishing service.

In the Roto-Finish Laboratory, technicians analyze your problem to determine the process which provides the desired finish at minimum cost. Often, it is necessary to develop a new compound to meet a specific need.



Test runs are then made in the Roto-Finish Processing Department under production conditions. If desired, your local Roto-Finish Customer's Man will run these tests in your own plant; so that you can check the results at first hand, results like this...

Roto-Finish CASE HISTORY

PART: Refrigeration compressor flapper valves. • MATERIAL: Swedish steel. OPERATIONS PERFORMED: Deburr. Generate full radii on all edges. Remove stress risers. • RESULT: Fatigue resistance increased 500%.

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Field Report . . .

working on more than 30 government prime contracts, and was recently named prime for Army's $23 million development program for the Shillelagh surface-to-surface guided missile. "Merging will permit more effective company support of Aeronutronic programs . . . to facilitate undertaking of more extensive projects than have been possible in the past," Ford says.

Potter & Brumfield Inc...

. . . Princeton, Ind, subsidiary of American Machine & Foundry Co, has been made an AMF division. A manufacturer of electromagnetic relays, and purchased by AMF in 1954, the company's name has been changed to Potter & Brumfield Division of American Machine & Foundry Co.

Scully-Jones Adds to Line

Scully-Jones & Co, Chicago, has acquired the complete line of Tychoway antifriction way bearings. It will also stock and service the Sure-Bore line of micrometrically adjustable boring tools.

Murfreesboro Machine & Tool...

. . . has moved from Murfreesboro, Tenn, to Nashville, and has changed its name to Southern Tool & Cutter Grinding Co. Reportedly Nashville's first specialized tool grinding service for industry, the firm processes all types of tools and alters many to specialized purposes.

"This job won't prove too difficult as long as your work is always beyond reproach."

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MACHINE TOOLS — *Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 32-page catalog 59 illustrates and describes products of company's divisions. Units covered (with attachments, accessories, and specifications) include: horizontal boring, drilling, and milling machines; planers; boring and turning mills; milling machines; automated control systems; vertical turret lathes; universal radial drilling machines; gang drilling machines; production drilling machines; standard and special engineered tooling; line and stub boring bars, block cutters; boring heads; and tap-savers.

2 CUTTING AND SHEARING EQUIPMENT—*Peck, Stow & Wilcox Co, Southington, Conn.* 48-page catalog 159 contains illustrated information on machines and hand tools for cutting and shearing sheet materials and other fabricating operations such as folding, forming, grooving, crimping, and slitting. Capacities listed together with descriptive data on over 100 different models. Hand tool section illustrates and describes complete Pexto Line.

3 LIGHT-HEAVYWEIGHT MACHINE TOOLS — *Rockwell Manufacturing Co, Walker-Turner Power Tool Div, 400 N Lexington Ave, Pittsburgh 8, Penna.* Revised 48-page catalog WT-50-9 describes complete line including drillpresses, grinders, cutoff machines, bandsaws, and belt and disk surfacers. New units covered include 17-in. drillpress; 2½-in. belt grinder; and 20 in. bandsaw.

4 THREAD ROLLING MACHINE—*Landis Machine Co, Waynesboro, Penna.* 16-page booklet contains illustrated description of the Lanhyrol (3-in. capacity) hydraulic thread rolling and forming machine. Explains infeed, continuous, and thrufeed methods of rolling with the machine. Applications pictured with description of attachments and accessories suited to specific requirements.

● EYELETING MACHINES—*United Shoe Machinery Corp, Eyelet Dept, 140 Federal St, Boston 7, Mass.* 48-page illustrated catalog contains detailed information on the several classifications of eyelets and complete line of equipment. Stock status of each eyelet is indicated; they are described and classified both by type and by using industries. Range of machines covered with dimensions and specifications, plus descriptions of special attachments. Request direct on company letterhead.

5 HYDRAULIC TRACER CONTROLS —*James Engineering & Machinery Co, Micro-Hydro Duplicator Div, 2451 Monroe Blvd, Dearborn, Mich.* 4-page bulletin gives data on line of duplicators for any type of machine. Three types of units described: for single, two, or three-dimensional tracing.

6 NUMERICAL POSITIONING CONTROL—*General Electric Co, Schenectady 5, NY.* 6-page bulletin GEC-1531 contains details on complete line of standard, pre-engineered packages for use on any machine requiring point-to-point positioning of linear or rotary-motion members. Controls discussed range from the Mark I through the Mark V—a system for automatic simultaneous control of from one to five linear or rotary motions from input data stored on standard one-inch-wide punched tape or manually set decade switches. Specifications, performance, and auxiliary functions described.

DI-ACRO ROD PARTER cuts off 3,250 pieces/hr. for Geometric Stamping Co.

Donald Boyd, methods engineer, shows parted stock and the formed part, handle for material handling equipment

About 1½ million pieces of bar stock are parted off each year on a Di-Acro Power Rod Parter at the Geometric Stamping Co. Div. of Euclid Stamping Co. in Cleveland. Twenty-foot lengths of 5/16″ cold drawn steel are cut to 7″ pieces at a rate of 3,250 pieces per hour.

"Instead of investing in a single purpose punch press die," says Donald Boyd, methods engineer, "We picked the power parter for its versatility. On this job and a variety of other work the power parter has increased production two times—it's actually twice as fast. Incidentally, there has been little or no maintenance other than periodic lubrication and resharpening of die heads."

For your bar stock up to ⅝″ in diameter, investigate the Di-Acro Rod Parter. Speedmatic gauge cuts as fast as operator can feed. Minimum distortion—pieces can be threaded without de-burring. One standard die cuts eleven sizes. Special square, hex and other heads.

DI-ACRO HAND OPERATED ROD PARTER

Same size-range and accurate parting as power parter. Ejectomatic gauge automatically clears die after each cut.

For free booklet, "Handy Guide to Rod Parters," consult yellow pages under Machinery—Machine Tools for your nearest Di-Acro distributor or write us.

Find Us Fast In The Yellow Pages

pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.

405 Eighth Avenue • Lake City, Minnesota

CIRCLE 303 READER SERVICE CARD

For smoother, easier drawing and forming

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

Oakite DRAW CLEAN "M" cuts forming rejects, lengthens tool and die life, washes off fast

New Oakite Draw Clean "M" lubricant smoothes the way for lower reject rates on drawing and forming steel, aluminum, copper and brass. How? Draw Clean "M" clings to metal with such tenacity that pressures of 40 thousand psi cannot wipe it off. Even the thinnest film will prevent seizure that causes build-up, galling and scratching.

The components of Draw Clean "M" are soluble and, at annealing temperatures volatile. This is important to you because while it clings where most other compounds wipe away—it can be removed easily in a mild detergent solution. Yet the residue, if allowed to remain, is not harmful to metal or man.

By diluting with water in ratios as high as 1 to 9 Oakite Draw Clean "M" offers astonishing per-unit cost savings. It extends die life three times the previous experience. Miscible with both water and oil it may be adapted to any of the following:

light stamping	stretch forming	spinning
deep drawing	tube bending	punching
cold heading	tapping	wet grinding

Ask your Oakite man for bulletin F-10393 or write Oakite Products, Inc., 26H Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE. SCIENCE

50 1909-1959 *years' leadership in industrial cleaning*

Free Literature

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7 PRESSES—*Service Machine Co, 2310 W 78th St, Chicago 20, Ill.* 4-page condensed catalog illustrates and describes 22 floor model presses including double crank; OBI; deep throat; deep throat (OBI) inclinable; and horn, plus six bench models and the new Econo-Air friction clutch and brake unit. Includes specifications and a table on punching and shearing data.

8 LIVE CENTERS—*J & S Tool Co, 87 Dorra Ave, Livingston, N.J.* 12-page folder describes complete line. Contains illustrations, diagrams, and specifications of precision-built unit with accuracy better than 0.0001 in.

TOOLS AND ACCESSORIES

9 INDEXING TABLE—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 4-page bulletin X59 contains information on the Ultradex table that provides angular indexing to any degree setting within ¼ sec of arc. About three seconds time is required to index. Specifications on two models are included; construction details, testing operations, and applications illustrated. Special adapter plate for indexing in increments smaller than a full degree is described.

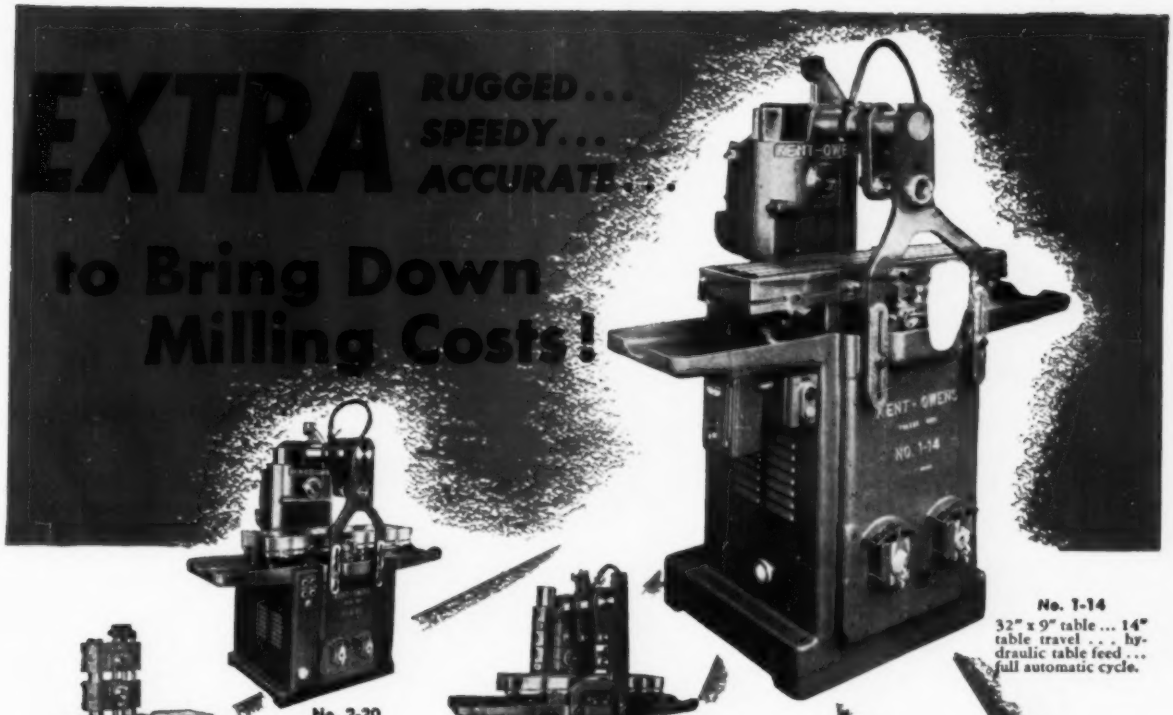
10 MARKING DEVICES—*New Method Steel Stamps, Inc, 147 Jos Campau, Detroit 7, Mich.* 24-page illustrated catalog MA-59 gives data on automatic roll marker and manual marking devices. Models for automatic OD and radial end-face marking are shown together with manual flat and round face markers, hammers, inspectors' stamps, holders.

11 DYNAMIC-MEASURING AND RECORDING INSTRUMENTS — *Consolidated Electrodynamics Corp, 360 Sierra Madre Villa, Pasadena, Calif.* 16-page general catalog 1310 illustrates and describes line including oscillographs, data amplifiers, and bridge balances; vibration measuring equipment; power supplies. Includes a summary of specifications for CEC standard galvanometers.

"Who trained this police dog to help me?"

EXTRA RUGGED... SPEEDY... ACCURATE...

to Bring Down Milling Costs!



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32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.

No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

No. 2-20DS
Double Spindle for two milling operations at same time ... 20" table travel ... 42" x 12" table.

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Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

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20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.

No. 3-36 ... 36" table travel ... 64" x 16" table ... full automatic hydraulic feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout make the difference ... greater dependability ... accuracy maintained. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #757 on wide range of hydraulic and hand-operated machines. Let us quote on proper machine complete with tooling for your operation. Also, call on Kent-Owens for special machines. Kent-Owens Machine Co., Toledo, Ohio.

KENT-OWENS
for milling machines

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Four States Mach'y Company

CLEVELAND
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DALLAS
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DAYTON
C. H. Gossger Mach'y Co.

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FT. WAYNE
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SAN FRANCISCO
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ST. LOUIS
Wm. Scheer Company

SEATTLE
Starbuck Machine Tool Co.

SYRACUSE
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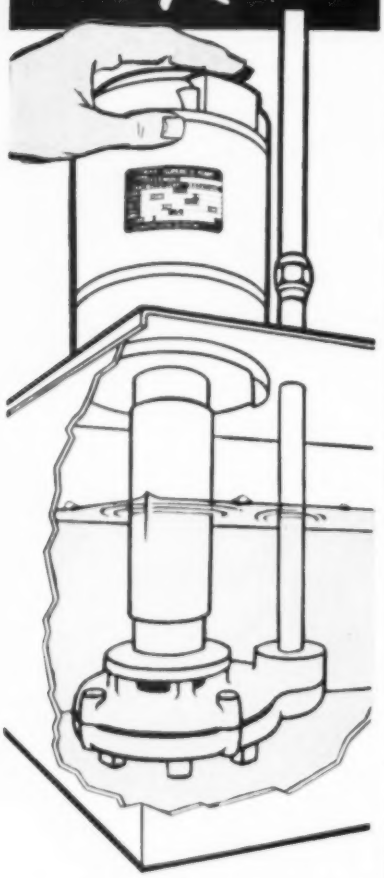
put a GRAYMILLS COOLANT PUMP on that machine and *Relax*



You'll get smooth, quiet performance, abundant volume, year after year, at less cost. They're dependable, abrasive proof, need practically *no* service. Interchangeable. Standard NEMA motors (also JIC Models).

Coolant pump shown is Model 33JL ¼ H.P. Get it from your Industrial Distributor.

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Showing standard and JIC Model centrifugal and gear type 1/25 to 2 H.P. Pumps, Pumping Units, Accessories and helpful selection chart.

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Free Literature

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12 PHOTOELECTRIC CONTROLS — *General Electric Co, Schenectady 5, NY.* 16-page bulletin GEA-6822 describes full line for counting, sorting, signaling, protecting, diverting, detecting, or limiting jobs. Specifications and pricing data given for relays (self contained, transistorized, high-speed, explosion-proof, long-distance); electronic timer; cutoff register control; and other electronic devices. Applications illustrated.

13 END MILLS—*Pratt & Whitney Co, Charter Oak Blvd, West Hartford, Conn.* Circular 628 pictures and gives data on new G Type end milling cutters featuring continuous, "flow curve" fluting, eccentric radial relief; and highly polished flutes. Sizes and dimensions, and recommended uses listed in tabular form.

14 TORSION TESTING MACHINES—*Tinius Olsen Testing Machine Co, 835 Easton Rd, Willow Grove, Penna.* 10-page bulletin 58 describes units which load and indicate torque loads alternately in either direction of rotation using only one set of grips. Operator can select any of four range capacities at any time during the test. Machines are available in torsion capacities of from 60,000 to 1,000,000 in. lbs. Low-Torq machines for low capacity torsion testing are covered, as well as wire twisting units and related equipment.

15 TOOLING SYSTEM—*Valenite Metals, Box 205, Royal Oak, Mich.* 20-page catalog VBU 59A explains how the VBU system cuts costs and speeds production on complex multi-point and multi-diameter tooling. System makes possible the use of standard throwaway insert tools and tool elements on multi-point tooling, in which boring, chamfering, facing, and other operations are combined. Lists more than 250 styles, sizes, and grades of standard VBU boring cutters, precision insert-holding cartridges, throwaway inserts and other component parts.

HEAT TREATING AND WELDING

16 CARBON DIOXIDE WELDING — *Air Reduction Sales Co, 150 E 42nd St, New York 17, NY.* 24-page catalog ADE 882 discusses Aircomatic (Airco's gas-shielded metal-arc process) welding of mild steel and low alloy steels with carbon dioxide shielding gas. Provides illustrated description of both the conventional CO_2 and the recently announced Dip Transfer CO_2 processes. Covers fundamentals of the process with descriptions of outstanding

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Tool Steel Topics

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Export Distributors: Bethlehem Steel Export Corporation

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characteristics; how both conventional and Dip Transfer welding are applied to specific jobs; and equipment used in Aircomatic CO_2 welding. Section covers manual welding guns and automatic welding heads, wire feeders, controls, welding wires, power supplies, and carbon dioxide equipment.

17 WELDING AND CUTTING EQUIPMENT—*National Cylinder Gas Division, 840 N Michigan Ave, Chicago 11, Ill.* 4-page illustrated bulletin N-112 gives information on equipment for maintenance repairs. Covers the Combo Kit portable welding and cutting outfit, Sureweld ac utility (shop) welders, and Sureweld dc Model SGW portable welders; Sod-R-Braze acetylene air torch for soldering, brazing, and heating; Sureweld spot welder, rods, cylinders, carts, and necessary accessories.

18 FLUX-CORED ELECTRODES —*—Arcos Corp, 1500 S 50th St, Philadelphia, Penna.* 4-page bulletin on Arcosarc electrodes and semi-automatic wire feed equipment describes portable equipment with non-electronic controls needed for CO_2 semi-automatic and automatic welding of mild and low alloy steels. Process in use is illustrated.

19 RESISTANCE HEATING UNITS—*Hevcott Corp, 1435 Preston St, Rockford, Ill.* 4-page bulletin illustrates and describes Reslec units. Includes case studies of the results of using heat in heading operations. Describes how difficult heading operations can be simplified through application of heat.

20 ARC WELDING DATA CARD—*Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Penna.* Data card TDC-155 provides information on joining tubing of similar or dissimilar types of steel by welding. Summarizes various recommendations for arc welding. In addition to indicating the proper type of electrodes to be used, it gives data on suggested preheat and post-heat treatments. Steels discussed are carbon, chromium-molybdenum alloy, and stainless.

PLANT SERVICE EQUIPMENT

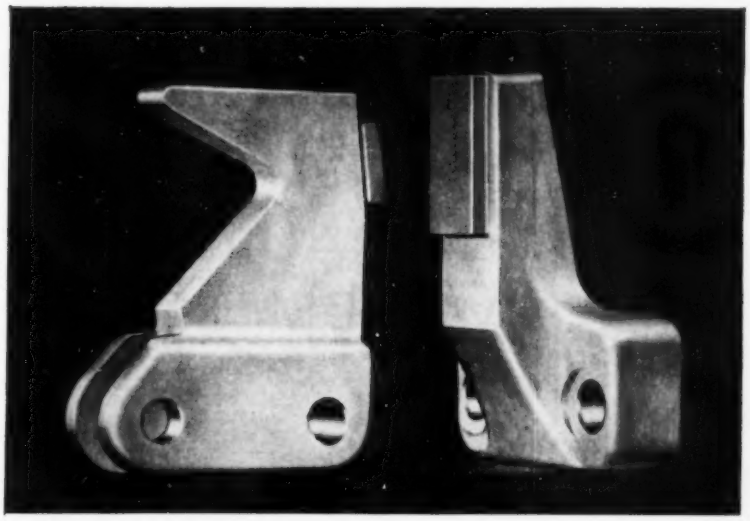
21 RHODIUM ELECTROPLATING PROCESSES—*Sel-Rex Corp, Precious Metals Div, 75 River Rd, Nutley 10, NJ.* 20-page illustrated booklet tells when, where,

(Continued on page 200)

"OK, OK, I'll rise, but I can tell you right now I'm not going to shine!"

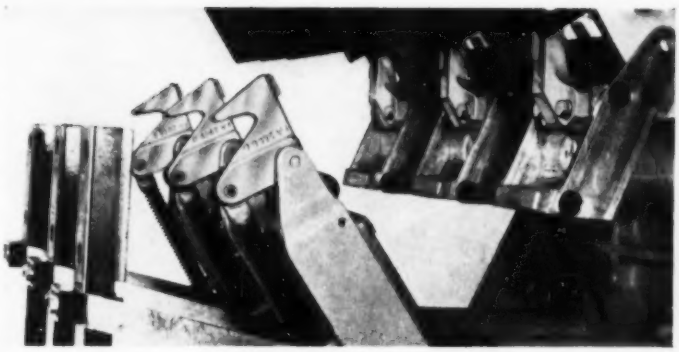
TWICE-WROUGHT METAL

of die-pressed forgings helps Federal Pacific make new air circuit breakers more rugged—cuts machining costs in half

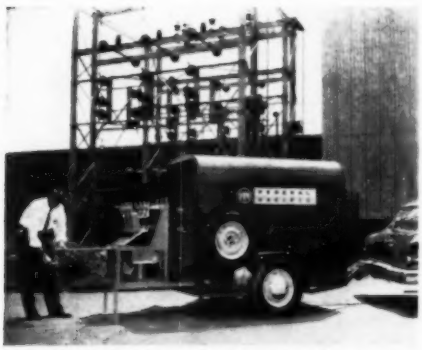


In its new Type DST magnetic air circuit breaker line, Federal Pacific Electric Company, Newark, N. J., builds in dependable operation and long life with parts of outstanding mechanical and adequate electrical properties.

Typical of this attention to detail are the arcing contacts (left). Similar parts previously used had been castings or built-up assemblies. Now the contact bodies are Anaconda Forging Brass-250 die-pressed forgings. The twice-wrought metal is denser, stronger, withstands mechanical shock better—reducing the fatigue factor and producing longer service life. The contacts also have higher conductivity. And best of all, their consistent dimensional accuracy and smooth finish cut machining costs in half.



RIGHT: Movable arcing contact assemblies at the left and the stationary arcing contact assemblies at the right in a 5-kv Federal Pacific Type DST air circuit breaker. They have a momentary current-carrying capacity of 60,000 amperes. Contact tips of tungsten alloy are silver-soldered to the forgings. These are two of several areas where Federal Pacific uses the superior physical properties of Anaconda die-pressed forgings to help provide dependable operation and long service life in its line of metal-clad switchgear.



Federal Pacific takes its circuit breakers out to industrial and electric utility customers. Here a representative sets up a demonstration of a 5-kv, 1,200-amp breaker in the field.

IT IS often easier than you think to achieve high quality and performance while simplifying fabrication and cutting over-all costs. American Brass technical specialists are constantly working with designers, production engineers and buyers, helping them meet their joint requirements—through the use of such Anaconda mill products as die-pressed forgings, extruded shapes, special-shape tubes. For this kind of practical help, see your American Brass representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Toronto 14, Ontario.

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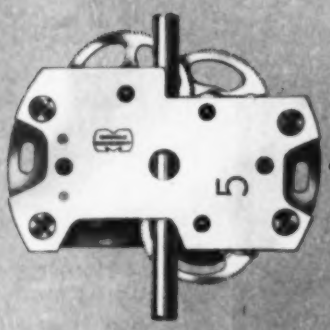

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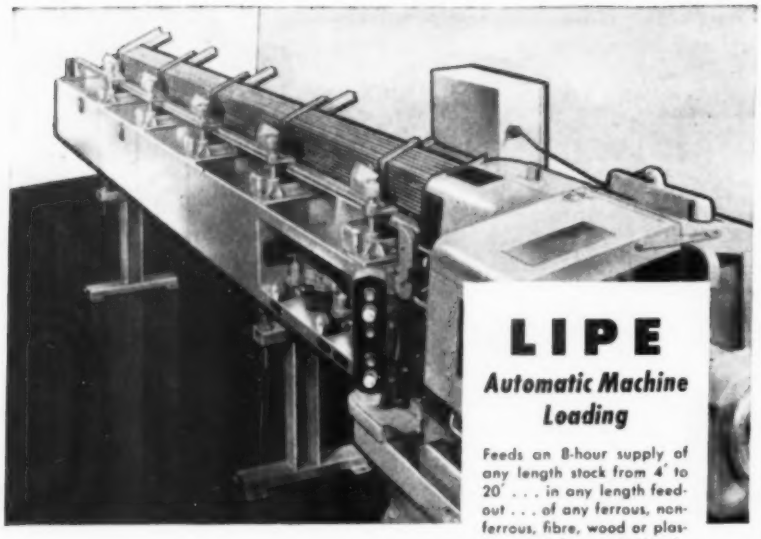

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and how to use rhodium electroplate in electrical, electronic, and other industrial applications. Discusses metallurgical properties; graphs and charts show rates of deposition under various operating conditions. Includes data on bath preparation and control of several different formulations; determination of rhodium in plating solutions; equipment required; current densities; recommended and general operating instructions.

22 PACKAGED AIR CONDITIONERS —*Acme Industries, Inc, Jackson, Mich.* 8-page bulletin 570 pictures and describes Model PAC line. Units, each a complete system, are available in several models ranging from 20 to 60 tons. Includes construction details, dimensions, model designations, cooling capacities, compressor motor hp.

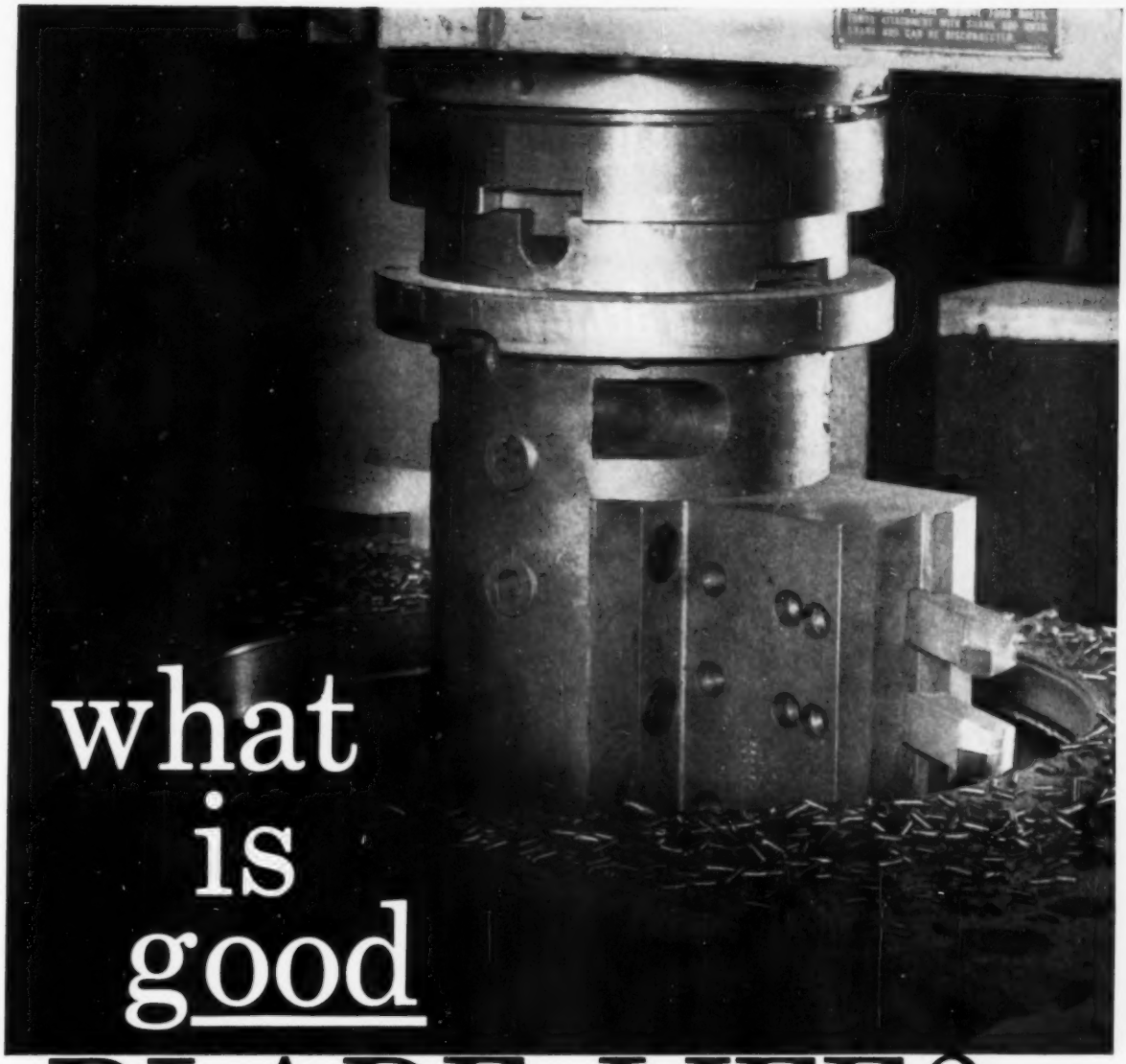
23 WORM GEAR JACKS—*Duff-Norton Co, PO Box 1389, Pittsburgh 30, Penna.* 8-page bulletin AD-66a provides information on the 1800 Series. Unit and its components are illustrated; specifications listed; applications of eight jacks in capacities from 2 to 100 tons pictured.

24 PERMANENT PLATE MAGNETS—*Stearns Magnetic Products, 635 S 28th St, Milwaukee 46, Wis.* 8-page bulletin 1074 illustrates and describes new Index V models for existing chutes, ducts, conveyors, or other material handling equipment. Tables indicate recommended magnet size according to conveyor size, speed of material flow, size or mesh of material.

25 GAS-FIRED DUCT HEATERS—*L J Wing Mfg Co, Linden, NJ.* 4-page bulletin GD-100 provides information on line of units for automatic heating. Also describes compact blower assemblies, both encased and open, for use with the unit heaters. Includes specifications, dimensions, ratings, performance, and physical data.

26 HEAVY-DUTY RAM TRUCKS — *Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio.* 6-page folder covers seven models in new line with ca-

"That couldn't have been made in this department. Our reject maker is on vacation."



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pacities from 20,000 to 80,000 lbs. Specifications and attachments included, as well as components, and on-the-job application photos.

27 VOLTAGE REGULATORS—*General Electric Co, Pittsfield, Mass.* 60-page illustrated book GEC-1450A includes applications, description, selection, weights, dimensions, and connection diagrams for GE's redesign of dry type and liquid filled Inductrol voltage regulators 60 and 400 cycles. Dry type single-phase units are offered in ratings up to 180 kva, 600 v and below; three-phase up to 720 kva for industrial and electronic applications, with manual, motor-driven, or automatic control. Liquid filled units are rated up to 2200 kva, 13,800 v and below.

PARTS AND MATERIALS

28 INDEXING MECHANISMS—*Ferguson Machine Corp of Indiana, 7818 Maplewood Industrial Court, St Louis 17, Mo.* 24-page catalog 108 gives data on high-speed, precision, roller gear drive mechanisms for achieving intermittent and oscillating motions. Included are units rated for speeds up to 2000 indexes a minute with provision of 0.001 in. and zero backlash for 8000 to 20,000 hours operation. Stock and standard components and housed units are shown, as well as Trans-Pac power assemblies, standard right angle drives, and gear reducers. Also tabulated are load ratings and dimensions of standard Intermittor index tables and rotary transfer machine bases employing the roller gear drive.

29 SPIROID GEARS — *Illinois Tool Works, Spiroid Div, 2501 N Keeler Ave, Chicago 39, Ill.* 36-page engineering manual presents information to assist in determining basic design requirements such as ratings, selections, center distances, bearing loads, mounting methods, etc. Photographs and drawings illustrate principle and application of Spiroid gears, a skew-axis gearing system for medium to high reduction ratios. Sections included on design advantages, applications, manufacturing, and dimensional design data.

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Metalworking shops in ever increasing number are specifying *Ledloy* steels in forgings. The trend started when it was found that forged parts made with *Ledloy* steels resulted in savings far surpassing the original higher cost of the forging. *Ledloy* is widely known as Inland Steel Company's trade name for any grade of steel to which lead has been added to obtain greater machinability. Forgings made from *Ledloy* steels can be heat treated and forged in exactly the same manner as similar non-leaded grades of open hearth steels, while machinability is increased up to 50% in many applications.

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cost-cutting factors:

Increased machinability, higher speeds and feeds, easier tolerance control, reduced tool wear, less down-time, greater production per tool change and fewer finishing operations.

Although it is well known that *Ledloy* Grade A can be machined 45% faster than B1113 and *Ledloy* Grade B 100% faster than B1112, it is not as widely realized that forgings made of *Ledloy* steels can show similar startling results. If present equipment is not being run at highest potential speeds, considerable savings can result using *Ledloy* grades and taking advantage of their much greater machining rate. Surface speeds of 325 feet per min. are common and much higher speeds are possible—up to 450 sfm with high speed tools and up to 600 sfm with carbide tooling when using Grade A *Ledloy* steel.

If current operations wear tools excessively, necessitating frequent tool changes, or if tooling cost is relatively high, *Ledloy* steels can effect significant savings. Because the Inland process of adding lead to steel lowers the steel's frictional component, less heat is generated during machining. *Ledloy* steel's shorter-length chips quickly fall clear of the tools, and tool-edge build-up is minimized. The end result, clearly discernable, is far greater production, less down-time for tool changes and a welcome reduction in total machining cost. *Ledloy* steel's lubricating and better-chip-forming qualities make it the fastest machining steel in the world. The superior surface finish obtainable with leaded steels can often result in the elimination of one or more subsequent finishing operations.

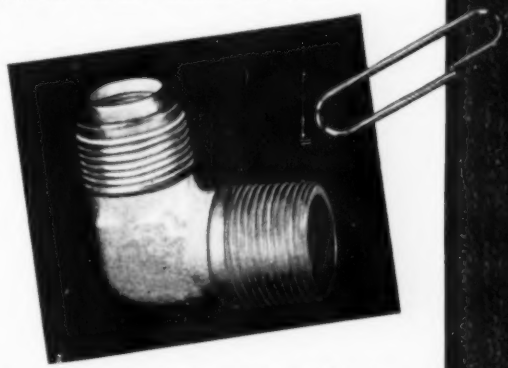
characteristics:

Inland regularly produces *Ledloy* free-machining open hearth steels to a wide variety of chemical specifications to meet customer requirements. In each instance, regardless of chemical composition, *the addition of lead by the Inland process results in no significant change in the desirable mechanical and metallurgical characteristics of the steel.* All the important qualities of open hearth steels such as ductility, impact values, transverse strength, case hardening qualities and cross sectional soundness, are fully retained. *The only thing changed is the machining characteristic which is vastly improved.*

availabilities:

Inland *Ledloy* free-machining steels are available in a wide range of standard carbon and alloy grades in bar form or plates. In forgings, the increase in machinability is every bit as good as that obtained in bar stock steel and finish is superior.

If your product requires machining, it will pay you to investigate the potential savings offered by Inland *Ledloy*—the original leaded steels. Ask your Cold Drawer or Steel Service Center about Inland leaded steels, today. They are offered as *Ledloy* or under other brand names. For the very informative booklet, "Properties of Inland Ledloy Steels," write to Inland Steel Company, 30 West Monroe Street, Chicago 3, Illinois.



A switch to Ledloy Grade A in these forged fittings permitted a 27% increase in machinability.

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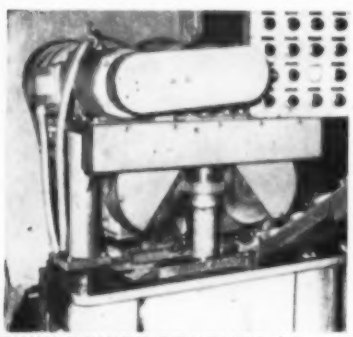

TWIN POWER BRUSHES deburr and edge-blend these parts on 7-second cycles. Osborn 6" Monitor® Brushes—operating at 1750 rpm—do the job at high production rates. Quality is excellent . . . cost is low.

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30 POWER TRANSMISSION — *Dodge Manufacturing Corp., Mishawaka, Ind.* 8-page bulletin A-716 covers Flexid ne dry fluid drives and Para-flex flexible cushion couplings. Pictures and describes such Taper-Lock products as steel conveyor pulleys, roller chain drives, various types of shaft couplings, and the Dyna-V line of V-belt drives.

31 HAND FORGINGS—*Kaiser Aluminum & Chemical Sales, Inc, 1924 Broadway, Oakland, Calif.* 20-page illustrated brochure contains engineering information, lists complete availabilities and properties. Forgings of any size can be supplied in any desired temper and in a variety of hand forged shapes for specific parts.

32 HYDRAULIC PACKINGS — *Crane Packing Co, Dept AM-3, 6400 Oakton St, Morton Grove, Ill.* 16-page illustrated bulletin P-333 on homogeneous and fabric reinforced packings covers design, construction, sizes, applications, installation, proper usage and service, and temperature factors for V-rings, U-cups, and piston cups. Also includes data on homogeneous wiper rings.

33 COBALT NICKEL SPRING ALLOY —*Elgin National Watch Co, Abrasives Div, Elgin, Ill.* 26-page illustrated handbook contains technical information on Elgiloy, an alloy with extremely high resistance to corrosion (superior to stainless steel), high resistance to set and fatigue (superior to carbon steel), and non-magnetic quality. Material will maintain its spring characteristics up to + 1000 F. Tables and performance graphs show mechanical properties in strip, wire, and rod form. Data included on heat treatment, welding, brazing, soldering, plating, electro-polishing, machining, and forming.

34 UNITIZED MOTORS—*General Electric Co, Schenectady 5, NY.* 12-page bulletin GEA-6882 (with inserted 4-page technical data bulletin) discusses features and points out basic advantages. Versatility, efficiency, new bearings, and insulation system illustrated and described. Lists applications for the motors in ratings from 1 mhp through 1/15 hp.

35 FASTENERS—*Star Stainless Screw Co, 699 Union Blvd, Paterson 2, NJ.* 24-page catalog 59-A covers full range of sizes and types of AN and MS fasteners. Includes data on rivets, cotter pins, piano hinges, pails, funnels, scoops, and screw machine products.

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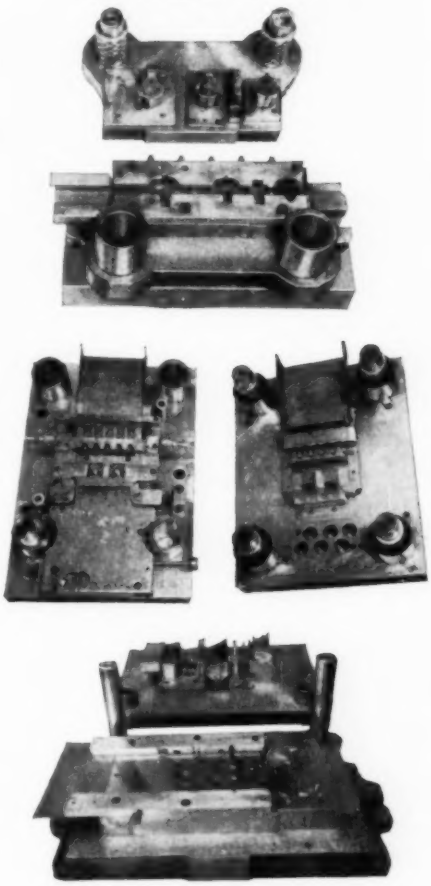

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OLYMPIC FM is an air hardening 12% chromium (D-2 type) die steel made to exacting standards by Latrobe Metalmasters . . . guaranteed to be fully-uniform in the distribution of wear-resisting carbide particles and alloy sulphides for better machinability . . . a result of Latrobe's exclusive DESEGATIZED® process of manufacture!

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WHEN BUYING FOR PRODUCTION—equipment, accessories, materials, supplies—the question often arises: "Who makes it? Where can we get it?"

Reach for the American Machinist Buyers' Guide Issue and you have the answers in an easy-to-use, complete and efficient package.

Bigger... and most complete The newest edition of the Buyers' Guide—your most effective, efficient buying tool—is now in preparation. To be issued in September, 1959, the Buyers' Guide Issue will put at your fingertips the...

Buyers' Guide Section...over 27,000 listings...products of 3,400 manufacturers shown under 1,800 separate product headings;

Metals Supply Section...city-by-city listings of steel warehouses (with types available) plus warehouse list of non-ferrous metal sources (aluminum, copper, brass);

Machine Tool Distributor Directory...local sources for machine tools in your area...presented both alphabetically and by machine tool builders ...with phone numbers and addresses;

Technical Metalworking Sections ...eight editorial-advertising sections covering principal Metalworking functions (Machining, Tooling, Press-Working, Inspection, Materials, etc.).

Easy to use...for you The American Machinist Buyers' Guide Issue is designed with *your needs in mind*. Sim-

plicity of use by production executives guides its preparation. Thus you get...

integrated information sections... major portions of the issue work together...Buyers' Guide Section leads you to Warehouse and Distributor directories...bold-face listings for advertisers refer you to specific pages where you can obtain complete application/specification data from manufacturers;

different colored paper for major sections...enables you to put your hand on exactly the information desired without time-consuming searching... no complicated code references;

"lie flat" binding...allows you to leave volume open at a specific page for reference without losing your place.

Preferred by production management

Just as regular issues of American Machinist are your best source for information on techniques, processes and "what's new", so the Buyers' Guide has become accepted as Metalworking's #1 buying data source.

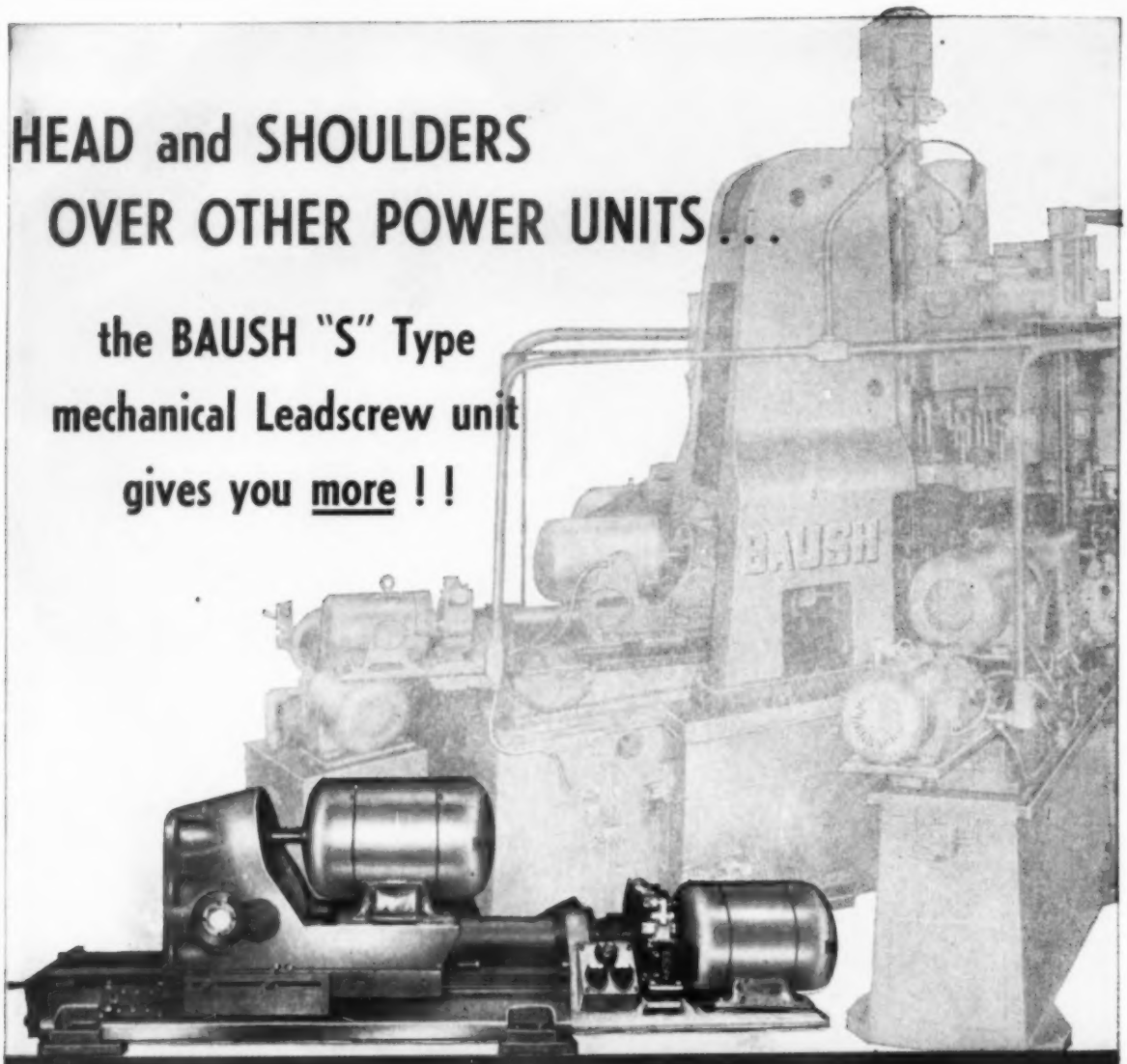
In a survey* among American Machinist subscribers, it was found that, next to the Yellow Pages of the phone book, the Buyers' Guide was Metalworking production management's most popular reference for industrial product source data.

If the product is made or bought by Metalworking...look first for the source in the Buyers' Guide Issue (the new edition in your hands September 1959).

*available on request

HEAD and SHOULDERS OVER OTHER POWER UNITS . . .

the BAUSH "S" Type mechanical Leadscrew unit gives you more ! !



OTHER MONEY SAVING FEATURES

- Less down time — with easy economical maintenance by shop mechanics
- Longer life of motors, gears, spindles, and guide bushings
- Positive, steady tool feed
- No surge or tool breakage in break-thru
- Interchangeability of units
- No costly hydraulic fluids
- No time-killing hydraulic leaks
- Operator starts work immediately — no waiting for warm-ups

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Jacob J Jaeger (left), executive vice president of Pratt & Whitney Co, West Hartford, Conn, has been elected president of the company. He succeeds **Edward P Gillane** (center) who has been named assistant to the chairman of the board. **Edward J Shages,** vice president, manufacturing, has been elected a member of the board of directors

NAMES IN THE NEWS...

Robert W Kerr has been elected president of Fairbanks, Morse & Co. He succeeds **Robert H Morse, Jr,** named vice chairman of the board. Mr Kerr is also vice president in charge of subsidiary operations for Fairbanks Whitney Corp, parent company.

P B Harwood, vice president, engineering, of Cutler-Hammer Inc, Milwaukee, has been appointed a senior vice president of the company. **E B Fitzgerald,** apparatus sales manager, succeeds Mr Harwood.

Adolph Vlcek Jr has been appointed director of manufacturing at the Martin Co's Baltimore Division. Formerly research manager, he succeeds **Vernon R Rawlings,** now general manager of the company's newly created Activation Division.

John S Davey has been elected vice president, sales, for Russell, Burdsall & Ward Bolt and Nut Co, Port Chester, NY. He was previously vice president, research and engineering.

Maxwell M Wachowiak, executive vice president of Wall Tube & Metal Products Co, Newport, Tenn, and New York, has been appointed director of manufacturing of Minneapolis-Moline, Hopkins, Minn. **James A Miller,** chief engineer of lift trucks for Clark Equipment Co, Battle Creek, Mich, has joined M-M as director of engineering.

G R Bouwkamp has been named manager of automotive valve tappet manufacturing at Chicago Screw Co, Bellwood, Ill. He was previously chief production engineer for the company's Tappet Division.

John P Davidson has been appointed production control manager of Chrysler Corp's New Process Gear Division, Syracuse, NY. He was previously assigned to the company's Axle and Transmission Division office in Detroit as a material and parts control staff assistant.

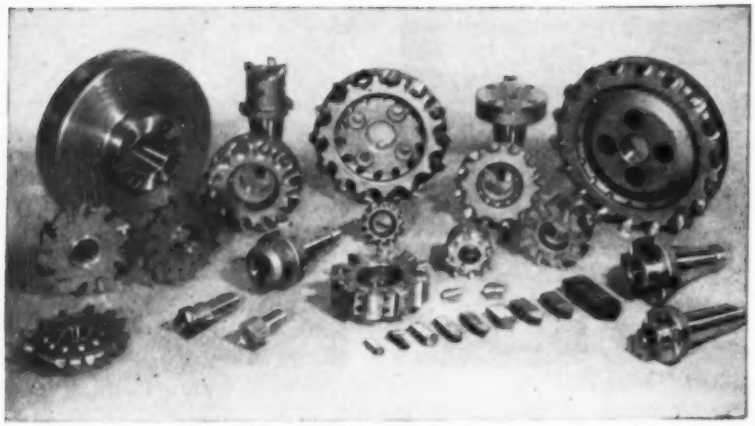
Emanuel Schugar, vice president-general manager of Houdaille Industries' Wales-Strippit Division, Akron, NY, has been appointed group vice president, heading several of Houdaille's manufacturing units. **Russell A Johnson,** general sales manager at Wales-Strippit, has been named general manager of the Division.

Glenn Mason has been named sales manager of the Jes-Cal Co, Fraser, Mich, subsidiary of the National Automatic Tool Co, Richmond, Ind. He has been active in marketing Jes-Cal's line of honing tools.

Joseph C Olson, factory manager of the Bullard Co, Bridgeport, Conn, has been elected vice president, manufacturing

Robert E McKee has been named sales manager for the R K LeBlond Machine Tool Co, Cincinnati. He was formerly sales engineer and director of technical and engineering training for the company and its subsidiaries

Howard W Carlisle has been named manager of the Meta-Dynamics Division of the Cincinnati Milling Machine Co, succeeding **E D Vancil,** who has retired. Mr Carlisle has been affiliated with the Division since Feb 1958



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

NAMES IN THE NEWS...

Alex J Vogl, general manager of Wilton Tool Manufacturing Co, Schiller Park, Ill, has been elected president. **William Ferrick,** sales manager, has been appointed vice president-sales manager

Carl B McLaughlin, executive vice president of Tube Turns Plastics, Inc, Louisville, Ky, has been elected president of the company.

James C Cox, president of the S-M-S Corp, Detroit, has been elected president of the Resistance Welding Alloy Association. **H A Mullen,** manager of the resistance welding department of Ampco Metal Inc, Milwaukee, has been elected RWAA vice president.

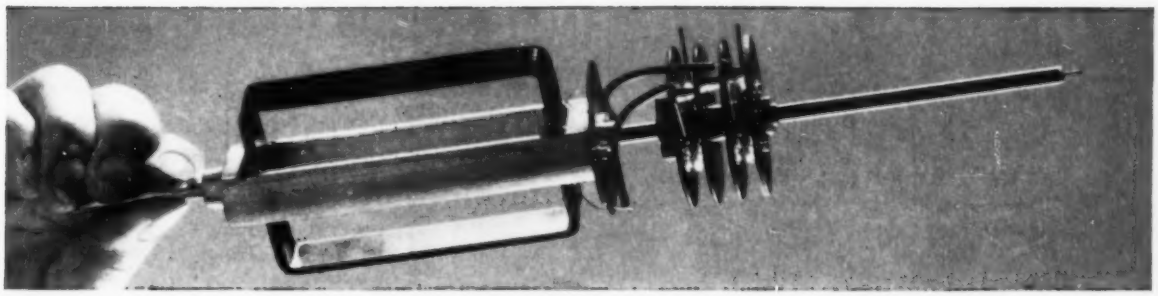
Willard J Harper has been promoted from chief mechanical engineer to chief engineer at Hanson-Van Winkle-Munning Co, Matawan, NJ. **David M Roney Jr,** assistant sales manager, has been made sales manager, Equipment Division.

O M Haseltine has been appointed sales manager of Ajax Electric Co, Philadelphia manufacturer of salt bath furnaces. He has been sales engineer in the Chicago and midwest territory.

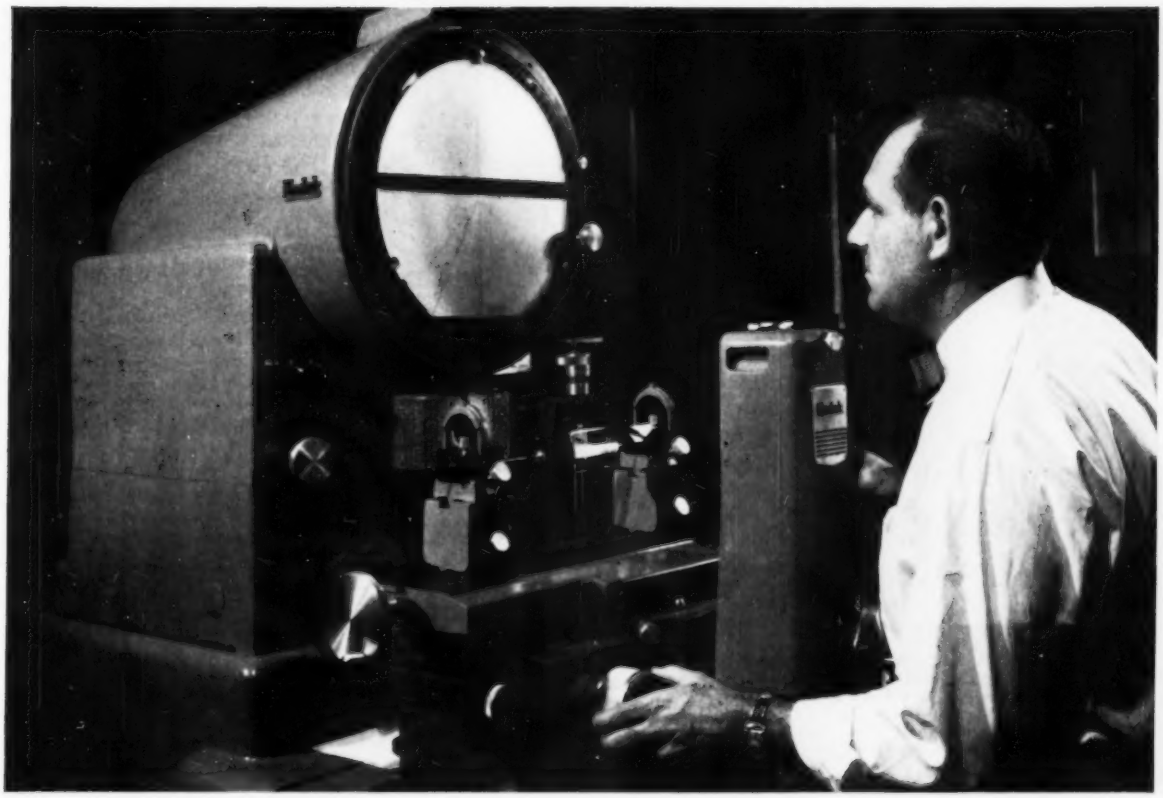
Robert B Schulters has joined Thor Power Tool Co as director of engineering at the Aurora (Ill) Works.

William S Powell has been named senior vice president, manufacturing, of Consolidated Freightways, Inc, Menlo Park, Calif, motor carrier maker.

Arnold W Ackerman has been appointed vice president and technical director of Anderson Oil & Chemical Co, Portland, Conn. He has been serving as chief chemist and director of research. **Thomas M Purtell,**



Before Westinghouse said "You can be SURE"...



they checked concentricity with this Kodak Contour Projector

What you see above is the moving element used in Westinghouse Type 44 electrical recording instruments.

Exact clearance between this element and the stationary elements is essential since these instruments often must be used in extreme temperature zones. This, along with the accumulation of tolerances in the complete assembly means that control of *concentricity* is vital.

You *could* check using surface plate, V-blocks, and height gage with clock indicator.

But Westinghouse checked concentricity with a Kodak Contour Projector. They saved time. They saved the cost of gages. They had *no* worries about damaging delicate parts because a beam of light exerts no pressure. And engineers were able to make corrections *before* production was started.

You, too, can be sure about effective, economical inspection with a Kodak Contour Projector.

The Model 14-5, shown in use at Westinghouse, is one of 6 models. They range from a portable, bench type model with 8-inch screen to the big 30-inch screen model.

Get all the facts. Write to:

Special Products Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

Machine Hack Blade Quality at the tooth-edge where it means the most

Disston's machine hack saw blades save you money, because every tooth is precision milled to strict standards. Each tooth cuts, because each tooth is the same length—an absolute necessity for accuracy and long life. Nearly all hack saws have good steel but Disston's precision is unexcelled.

Disston's Super-Safe Blade is the safest on the market . . . absorbs heaviest strains without shattering because it is made of composite steel. This hack is as stiff as a cemented all-hard blade—giving rigidity for accurate cutting without heating.

Disston's High Speed Steel Blade is a high tungsten blade—so tough, so hard, and so strong, it cuts easily through metals that ordinary steel cannot cut.

Disston's Di-Mol Blade, molybdenum high speed steel, a dependable, all-purpose blade for general shop production, where multi-purpose cutting is required.

See your distributor for more detailed information about Disston's quality machine and hand hacks, metal band, and circular saws—made for all industry requirements in a full line of sizes and tooth spacings. Or write to *Disston Division, H. K. Porter Company, Inc., 197 Tacony, Philadelphia 35, Pa. In Canada Box 530, Acton, Ont.*

DISSTON PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

NAMES IN THE NEWS...

general manager of sales, has been appointed vice president and sales manager.

William C Krecklow and **George J Slies** have been promoted to general superintendents in the manufacturing department of Allis-Chalmers' Industries Group. Mr Krecklow was formerly manager of the Group's production control department; Mr Slies has been serving as superintendent of centrifugal pump manufacturing.

William C Ridge, vice president, production, at John A Roebling's Sons Corp, has been appointed executive vice president of the company. He succeeds **Charles R Tyson** who has resigned.

James A Neff has joined Mechanical Air Controls, Inc, Detroit, as vice president and general manager. He was formerly associated with the Neff Engineering Co, Fort Wayne, Ind, in sales and engineering in the pneumatic and hydraulic fields.

Cornelius S Kipfer has been appointed superintendent of the Central Shops, Argonne National Laboratory's facility for the engineering design and construction of special equipment used in nuclear research.

Victor Del Greco has been promoted from foreman to superintendent of micrometer assembly operations at J T Slocomb Co, South Glastonbury, Conn.

Ed Libby has been appointed chief engineer and **Wendell C Northern** plant superintendent at Benchmaster, Gardena, Calif., manufacturer of punch presses, Koil-Kradles, and straightening machines.

David G Kelton, assistant general sales manager of the Cleveland Cap Screw Co, has been appointed sales manager, eastern states territory.

Ernest Quastler has been appointed plant manager of the London, Ontario, facility of Ex-Cell-O Corp of Canada, Ltd. He was formerly production development engineer.

Leland C Launer has been named president of Hadco Engineering Co, Huntington Park, Calif, designer and builder of ground-handling equipment for the aircraft and missile industry. Mr Launer was previously executive vice president of Fletcher Aviation Corp.

Aircraft Components Manufacturer Specifies

OSTUCO *Forged Tubing*

FOR LOWER MACHINING COSTS

Forging tube end in Shelby mill. In addition, Ohio Seamless can supply tubing flared, swaged, expanded, upset, flanged, shaped, etc.

"Our machining time on this landing gear part in SAE 4140 plummeted from *400 to 180 minutes* when we changed from forgings to Ostuco Forged Tubing.

"In addition to getting *over 80% more parts per workshift*, we like the free-machining qualities of Ostuco tubing that give us extra savings in set-up time and tool grinding costs . . . "

These actual figures, from an eastern manufacturer, indicate the machining economies Ostuco Forged Tubing can effect in your product. The starting point is to call your nearest Ohio Seamless office, listed in the Yellow Pages, or the plant at *Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.*

AA 8850

OSTUCO TUBING

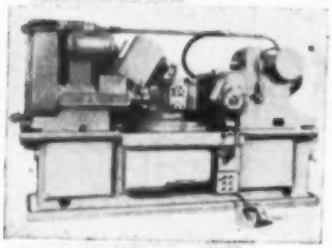
OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, St. Petersburgh, Salt Lake City, Seattle, Tulsa, Wichita CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore, it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY SPEED

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

NAMES IN THE NEWS...

Vincent E Ryb, manufacturing manager at AC Spark Plug, the Electronics Division of General Motors in Milwaukee, has been appointed manager of the Titan ICBM guidance program. **Donald F Ayres,** director of gyro, components, and engineering services, has been named manager of the Thor missile and the Mace jet-powered missile guidance programs. **Frank Cuthbertson,** master mechanic, has been promoted to director of production engineering; **Howard Fish,** assistant master mechanic, has been named manufacturing manager; **Charles Rose,** business manager and superintendent of defense products in Flint, has been appointed manager of production control; **Lawrence Bossman,** plant engineer, has been made works engineer.

Edwin S Dyjak has been named district manager of the Detroit office of Pratt & Whitney Co. Formerly a machinery sales representative attached to the Detroit office, he succeeds **Alfred C Ekberg,** named district manager of the San Francisco office. Mr Ekberg replaces **Ernest P Haquette** who has retired after 42 years of service with the company.

Russell C Weigel has been elected president and director for the next two years of the Society of the Plastics Industry, Inc. Mr Weigel is assistant general manager of the Polychemicals Department of E I duPont de Nemours & Co. **Robert L Davidson,** vice president of Kurz-Kasch, Inc, Dayton, Ohio, has been elected vice president and director of SPI.

Roy C Matzen, who has represented Super Tool Co in the Chicago area for 20 years, has been named division manager of the new Chicago area industrial cutting tool center opened this month by Super Tool, division of Van Norman Industries of Detroit.

OBITUARIES

Louis Botwinik, 61, president of Botwinik Brothers, Inc, New Haven, Conn, machine tool rebuilder, died June 14 in that city.

Dr George A Stetson, 70, editor emeritus of the American Society of Mechanical Engineers and of its official publication, Mechanical Engineering, died June 20 in Stamford, Conn.

250,000 Power Tools per year with Cities Service Pacemaker T

Porter-Cable, one of the world's largest manufacturers of portable wood-working tools, has long known the value of quality in a lubricant as well as in a power tool. Each piece of equipment made by Porter-Cable is carefully pretested before manufacture and then continually tested for years after its original appearance on the market. It is this kind of thoroughness that led to Porter-Cable's choice of Cities Service Pacemaker 300 T as the hydraulic oil to power their Fostermatic Screw Machines and Landis Grinders.

But Cities Service Pacemaker T is more than a hydraulic oil . . . it is a multi-purpose line of lubricants suited for many applications. Porter-Cable also uses Pacemaker 300 T for lubricating valves in the plant's compressors. Pacemaker T can be used to lubricate bearings, diesel engines, electric motors, generators, reduction gear drives, turbines and in circulating systems.

Pacemaker T is available in various viscosities to give you one line of quality lubricants that can save costly warehouse space by simplifying your inventory . . . cut maintenance costs and extend equipment life. These oils have high viscosity index, excellent heat resistant properties and are chemically fortified against oxidation, corrosion, rust formation and foaming.

Contact your nearest Cities Service office and an experienced Lubrication Engineer will call to make specific recommendations for your plant on the use of Pacemaker T. Or for further information, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Porter-Cable Machine Company
Syracuse, New York

Porter-Cable Research Engineer testing engine for new lawnmower the company will produce soon. All new products undergo extensive research and testing before production.

Backbone of Production Line is Automatic Screw Machine. Pacemaker T gives outstanding performance as hydraulic medium in these machines as well as in Landis grinders and as a general lubricant!

CIRCLE 328 READER SERVICE CARD

IT HAS QUALITIES YOU WANT !

Bunting
Alcoa Aluminum Bars

BUNTING BEARING ALUMINUM offers improved quality over low priced Bronze Bars and at a comparable price. It possesses the important qualities which make a good sleeve bearing material, namely:

- Good heat conductivity
- Excellent embedability
- Good ductility
- High load-carrying capacity
- High resistance to corrosion
- Conformability to the shaft
- Good fatigue strength

Your Bunting distributor now has in stock 138 sizes of 13" tubular and solid Bunting Bearing Aluminum Bars. Write or ask for catalog and literature.

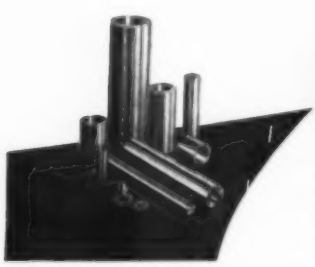
Other Products Available from Your Bunting Distributor

866 stock sizes of Bunting Cast Bronze Bearings and 267 sizes of Bunting Cast Bronze 13" Bars. 667 sizes of Bunting Sintered Oil-filled Bronze Plain, Flange and Thrust bearings and 84 sizes of Sintered Bronze 6½" Bars. Ask for Catalog 58.

343 sizes of Bunting Cast Bronze Electric Motor Bearings for all motors. Ask for Catalog 258.

ask him . . .

Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars — Bronze and Bearings — Bronze.



Bunting.

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE OR SINTERED METALS. ALCOA® ALUMINUM BARS.

The Bunting Brass and Bronze Company, Toledo 1, Ohio
Branches in Principal Cities
Copyright 1958 by The Bunting Brass and Bronze Co., Toledo, O.

NEW BOOKS...

MACHINE TOOL OPERATION, PART 1 (5TH EDITION). *By Henry D Burghardt, Henry Axelson, & James Anderson. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 588 pages, 5¼ x 8. Price $8.00.*

In the machine shop training field this book is too well known to need detailed review, but this new edition includes an enlarged treatment of the turret lathe, and a discussion of the extremely important subject of surface finish. Also added is a full and easily understood section on the new Unified Thread system, as well as an explanation of the way in which tools cut metal and of what happens at the cutting edge.

•

COATED ABRASIVES—*By Coated Abrasive Manufacturers Institute. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 426 pages. Price $8.50.*

This exhaustive book is both a history of the development of coated abrasives from the early days of the sanding block to the modern precision metalworking machines that grind or polish with abrasive belts, disks, or wheels, and a text on the use of this technique.

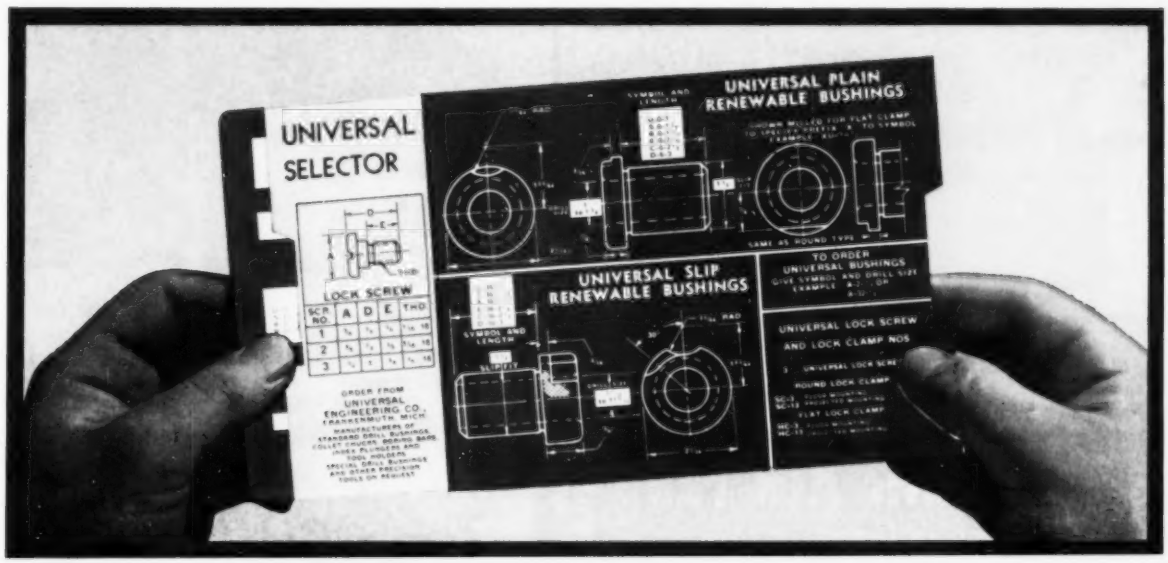
The development of coated abrasives is one of the success stories of modern industry. Perhaps because of the rapid growth of the field there are still many who don't recognize all the useful applications. This book will serve as a useful reference to manufacturers using coated abrasives, to machine builders, and to shop supervisors.

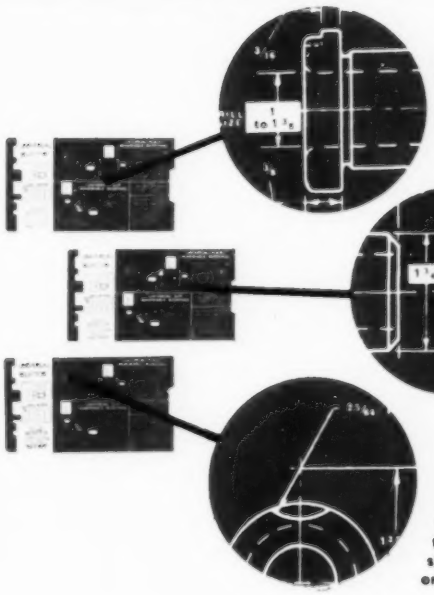
The volume has been prepared by the combined efforts of the ten member companies of the Coated Abrasive Manufacturers Institute.

"I don't want you boys to think of me as the president of this company, just think of me as one of you."

HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾″ drill size





The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.

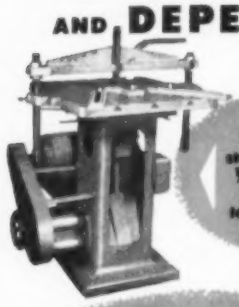
This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!

193

UNIVERSAL ENGINEERING CO. FRANKENMUTH 1, MICHIGAN

FOR **EFFICIENCY**
AND **DEPENDABILITY**
USE



Northfield KEYSEATERS
This keyseater is designed to cut straight or tapered keyways from ⅛" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

Northfield BAND SAWS
Speed, precision, dependability, value, all are painstakingly built into the Northfield 36" Band Saw. Speeds can be altered for different metals, plastics, fabrics, woods, etc.

Northfield CIRCULAR SAWS
A heavy duty, accurately constructed machine with every feature for circular sawing in any shop. Adaptable for cutting light metals, plastics, woods, etc.

WRITE TODAY FOR LITERATURE AND PRICES!

Northfield FOUNDRY & MACHINE CO.
★ ★ ★ NORTHFIELD, MINNESOTA, U. S. A.

CIRCLE 331 READER SERVICE CARD

SAVE 50%
or more in
CONTOUR GRINDING COSTS with
Micromaster

VISUAL GRIND

Sold by
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Visual Grind is manufactured by
The CLEVELAND GRINDING MACHINE Co.
1720 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE 333 READER SERVICE CARD

Ses-Matic AIR FEED
for feeding coiled stock to presses

Amazing in performance, outstanding for durability . . .

• Packed with power, speed, simplicity, accuracy . . . the Ses-Matic AIR FEED handles a wide range of press feeding jobs—mounts directly to the side of the press . . . simple adjustments when changing from one job to another. Models available for most stock widths, feed stroke lengths, and stock thicknesses up to .187 inches. Unit can be moved from press to press.

Write for catalog on Ses-Matic Air Feeds, Cradles, Straighteners and other coil handling equipment.

Ses-Matic
SPECIAL ENGINEERING SERVICE • INC.
8167 Livernois • Detroit 4, Mich.

2747

CAN YOU *SWING* IT?

A heavy duty 40" swing lathe, built to handle that occasional large swing ROLL up to 60"!

Write for "It's a Dual Spindle"

BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

CIRCLE 332 READER SERVICE CARD

CIRCLE 334 READER SERVICE CARD

"There have been a lot of changes in 39 years"

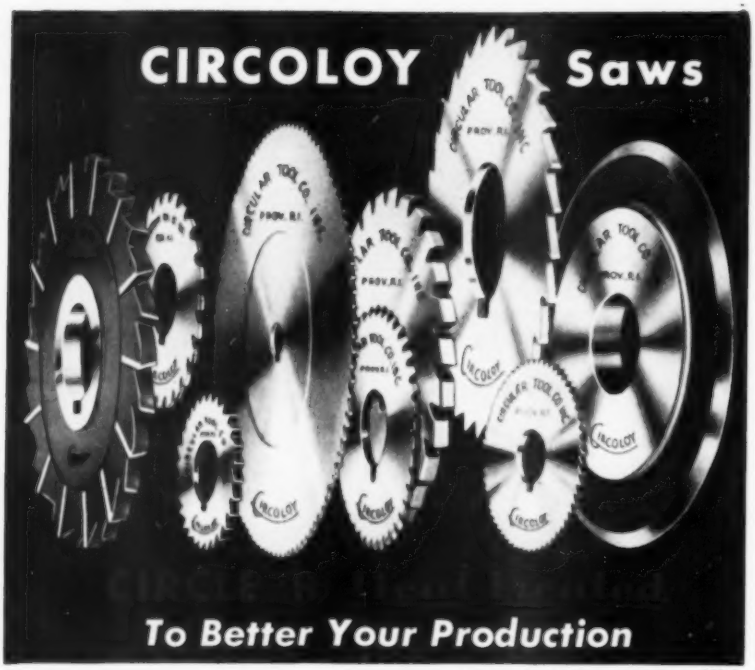
"When I opened up in 1920, I did practically everything in the shop myself. We have 61 people in the place now but I still have my eye on most of the operations. Since I keep up with the whole field, I'm in a good spot to see that our operations are up to snuff. Get lots of ideas from reading: business papers, technical publications and so on."

Our Mr. Topley (although he and his shop are hypothetical) is typical of the small—but important—high-volume plants in Metalworking. Little individually but of considerable size as a group, these firms are valuable customers of every Metalworking supplier.

American Machinist helps give production management—in both large and small plants—the perspective and know-how needed to guide operations in today's heavy competition. This is why more production engineers and executives subscribe to American Machinist than any other Metalworking publication. It explains why, throughout Metalworking, production men will tell you . . .

"I have to read American Machinist"

McGraw-Hill Magazine of Metalworking Production ●
330 West 42nd Street, New York 36, New York ●



CIRCLE R exclusive heat treating renders Circoloy Saws shock-resistant, non-brittle. They greatly outperform HSS in service life, longer production runs, superior cutting, lower cost. Ask your Circle R Specialist when to use Circoloy, especially in automation.

378-8

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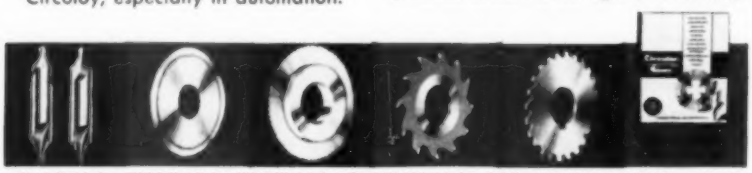
PROVIDENCE 5, RHODE ISLAND
Specialists in Circular Cutting Tools Since 1923



METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

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ADDITIONAL MARKET DATA AVAILABLE FROM THE AMERICAN MACHINIST INVENTORY

Statistics collected for American Machinist's unique census of metalworking equipment have been tabulated on IBM cards. Special runs to fit the inventory to your needs are now possible for a nominal fee. Write for complete information.

American Machinist Market Dept.
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Hazardous conditions (under foot) created through circumstances beyond control in today's high production cycle in your plant — *Are dollar-dangerous!*

An ounce of preventative maintenance outweighs dollars lost through accident to employees, damage to your equipment and non-productive down-time.

Florco is selectively mined and processed to give the most effective and economical all-purpose adsorbent available.

For the safest and best housekeeping service in your production line without costly applicators or removal equipment,

GO FLORCO AND SAVE!

Florco is easy and convenient to use:

- Cover area to be treated with a thin layer of Florco—and let set for a few moments.
- Sweep it up—the floor is clean and the hazardous slippery area is eliminated.

SEND TODAY for free demonstrative sample and descriptive pamphlet on Florco. Just enclose this ad with your signed business letterhead.

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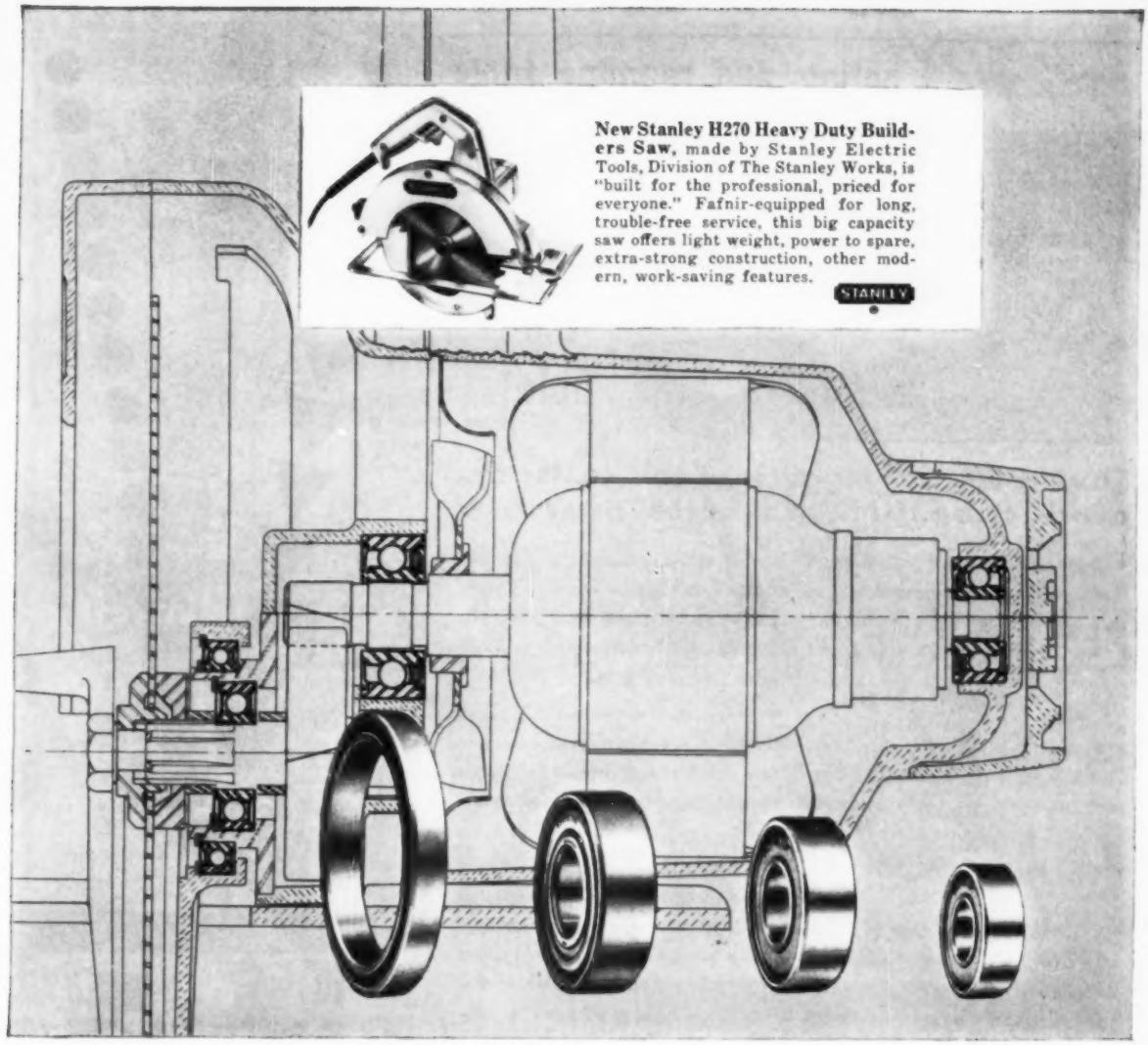

New Stanley H270 Heavy Duty Builders Saw, made by Stanley Electric Tools, Division of The Stanley Works, is "built for the professional, priced for everyone." Fafnir-equipped for long, trouble-free service, this big capacity saw offers light weight, power to spare, extra-strong construction, other modern, work-saving features.

STANLEY

New Stanley power saw, Fafnir ball bearing equipped, designed to deliver nearly 40% more cutting force!

Armature, saw shaft, even the blade guard Fafnir-mounted for free-starting, no-maintenance, heavy-duty performance

Nearly 40% more cutting force at working speeds, with 27% less operator effort! This new Stanley power saw represents a design achievement of the first order. And to insure long, efficient service life, Stanley makes generous use of Fafnir precision ball bearings. Even the blade guard is Fafnir-equipped (with an aircraft type bearing), for responsive action at the slightest pressure. On the armature and saw shaft, Fafnir ball bearings all but eliminate friction and wear. Bearing maintenance is eliminated, too. Various combinations of seals and shields lock out contaminants, lock in factory-packed lubricant. No danger of faulty or neglected lubrication... virtually no chance of bearing failure.

Take advantage of Fafnir's "designer's approach" to bearing problems. You'll find Fafnir's breadth of experience and diversity of line insure precise answers. Write The Fafnir Bearing Company, New Britain, Connecticut.

Sealed and shielded Fafnir ball bearings meet specific service requirements in Stanley saws

Felt seal and shield (Motor Armature)

2 Plya-Seals (Blade Guard)

Plya-Seal and shield (Saw Shaft)

FAFNIR BALL BEARINGS

replaceable boring and reaming tools *adjust* to fit the hole!

Save 70% or more in tool costs and production time on holes over 5/8"

- Diameter adjustable within ¼ in. range: Blades are expandable *as they wear* for maximum tool life and accurate tolerance control. Grind blades for tolerance *only; not* for size.
- Blades replaceable: Madison slotted bars wear indefinitely. You replace blades only, with costs averaging 1/3 that of solid flute reamers. Down-time for replacement and adjustment is negligible.
- Cut tool inventory: *One* Madison slotted bar can be used on holes of *many* varied diameters . . . since each bar accommodates a broad range of cutter sizes.
- No alignment problem: Madison reamer blades *float* in the bar slot . . . are self-centering in the hole. No floating holders required, no compensation for spindle wear. (NOTE: *Boring* cutters are *fixed* in their slots . . . do *not* float.)
- Free cutting action, no chip pack-up: Generous chip clearance permits free circulation of coolant for higher speeds, finer finishes, closer tolerances.
- Multiple operations in one pass can be performed simply by spacing standard Madison blades on specially made bars. Any combination of reaming, boring, chamfering and other hole-making jobs can be completed on a *variety of diameters* . . . and in *one pass!*

Write for further information to

MADISON *Industries* Dept. AR7, Box 1137 Providence, R. I.

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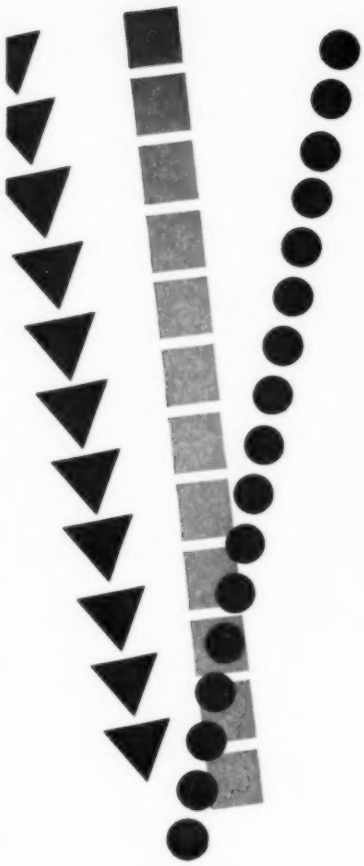
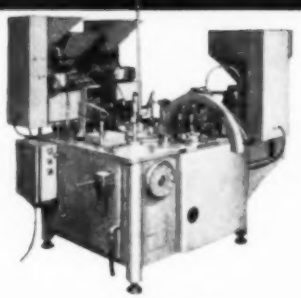
MARKET DATA ON METALWORKING EQUIPMENT IN USE IN YOUR SALES TERRITORIES.

American Machinist can tailor the inventory to supply you with important facts about market potentials in each of your specific sales areas. For details, write *American Machinist* Market Dept., 330 W. 42nd St., New York 36.





NEW V & O MACHINE

for small parts assembly

offers a basic operating principle almost endless in its applicability to cost reduction.

Emhart Manufacturing Co.
Hudson, New York
V & O Presses and Feeds

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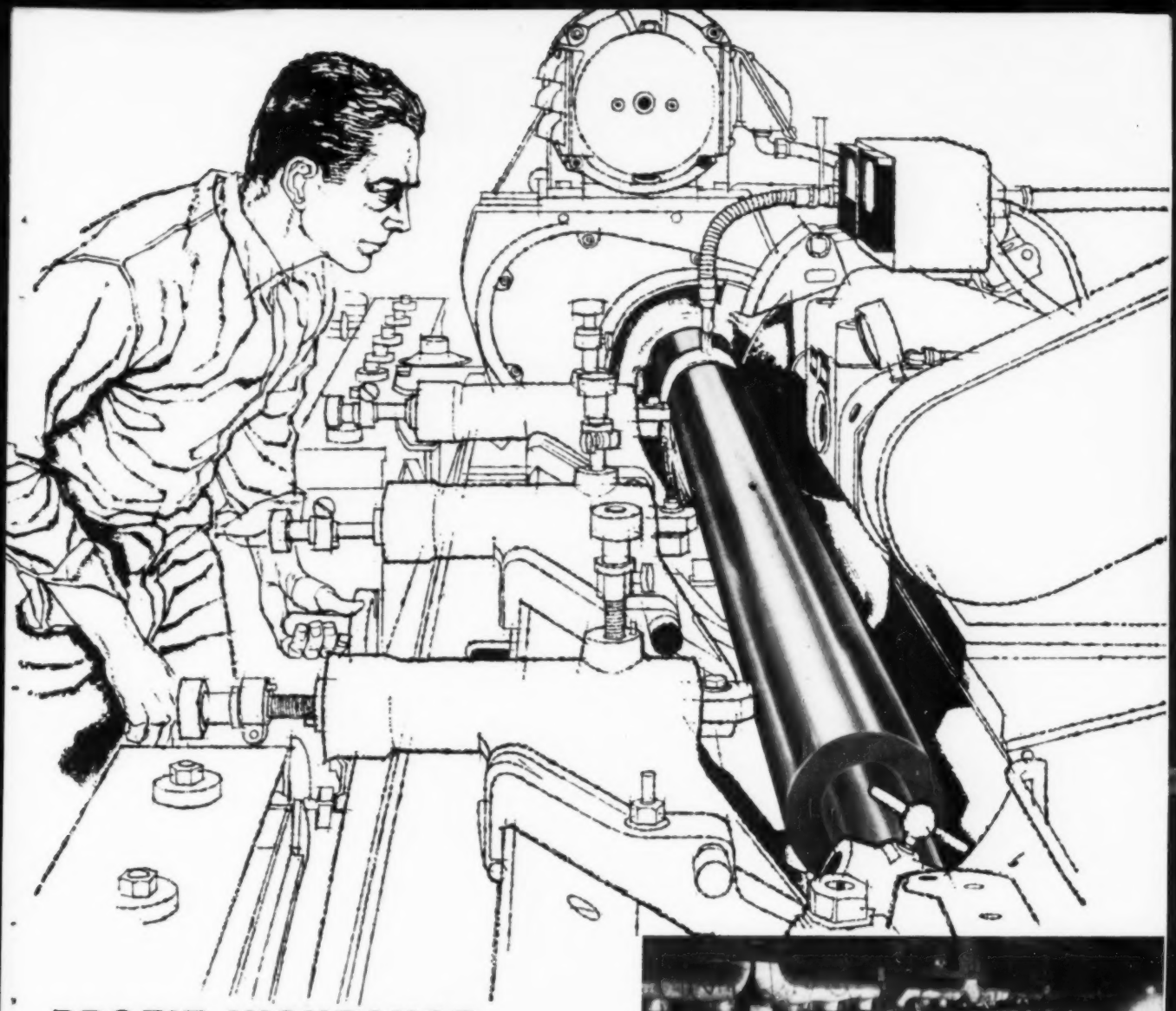

PROFIT INSURANCE with J&L Stainless Steel Bars

Your machining costs on stainless steel bars are part of your investment for profit. Add your costs for tooling, handling and polishing, and you multiply your investment, often many times over.

Scrapping a single bar wipes out that investment—and with it most of your profit on a large volume of finished goods.

Every step taken to reduce rejects helps insure profits! The biggest step you can take in that direction is to specify J&L **Consistent** Quality on all orders for stainless steel.

J&L leads the industry in melt shop standards for stainless steel —the point where quality starts, **and your profit insurance begins.**

Careful attention to every production detail is the key to J&L quality

J&L STAINLESS
SHEET • STRIP • BAR • WIRE

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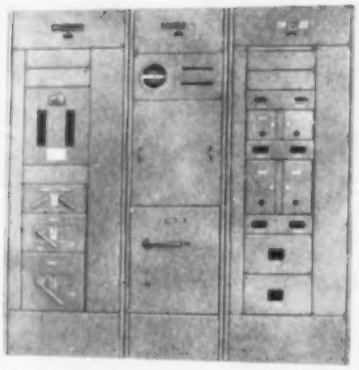
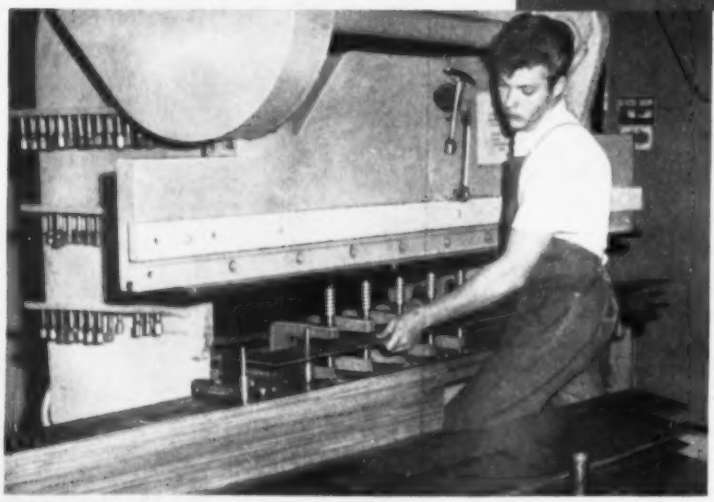
Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

Built better by "BULLDOG"... using THE COST-CUTTING **STRIPPIT** SYSTEM



Power switchboard by BULLDOG ELECTRIC. Fully interchangeable parts.



PRESS SETUPS OFF THE SHELF!

BULLDOG ELECTRIC stores Strippit drilled templates on conveniently located shelves, Strippit Hole Punching Units and Tooling on this mobile rack. Pilot pins on units slip-fit into template pilot holes for exact positioning, quick mounting outside press by bench man. All units reusable over and over in unlimited patterns.

NO LOSS OF PRESS TIME!

Strippit setups cut between-run time to a minimum—just remove last set-up from press bed, insert new one and start run. Both short and long runs are profitable with Strippit setups. Here, parts for BULLDOG switchboards are being perforated accurately and rapidly. In other operations, Strippit Notching Units provide equal flexibility.

H. J. LOCKWOOD, Plant Superintendent, **BULLDOG ELECTRIC PRODUCTS** of Los Angeles writes:

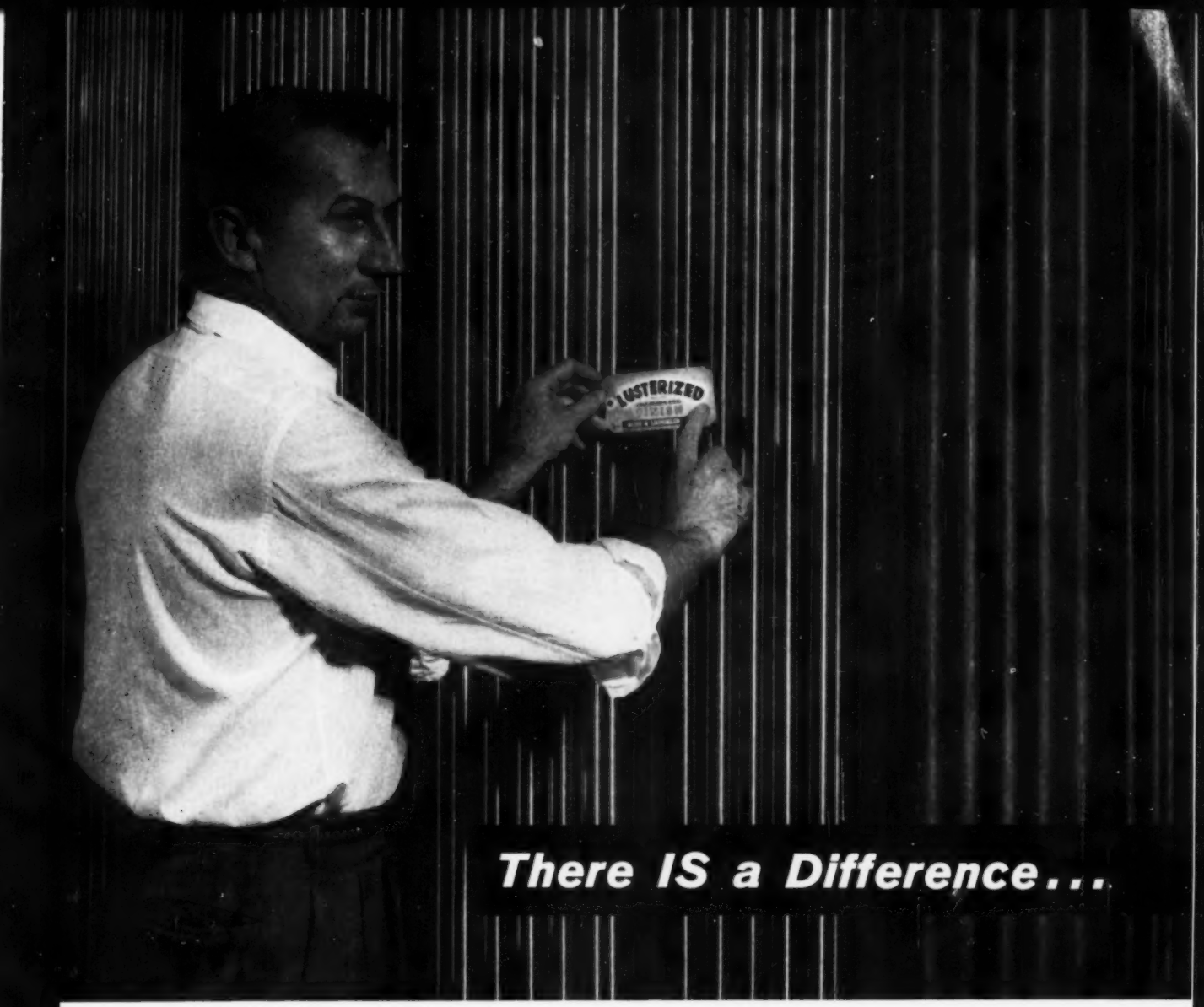
"In building BULLDOG Switchboards to perfect uniformity for full interchangeability of parts, I have centered our production methods around Strippit tooling. All the perforating and notching operations are performed without fixed dies. Work flows smoothly through the machines without tieups. In no other way could we produce this quality product so efficiently."

WRITE TODAY for details on the savings you could be enjoying with Strippit setups on your presses!

WALES STRIPPIT INC.

200 Buell Road, Akron, New York

Manufactured in Canada by: Strippit Tool & Machine Company, Brampton, Ont.



...a BIG DIFFERENCE in Cold Drawn Bars

Contrary to popular belief, all cold drawn bar steel is not alike. There is one big difference worthy of your specification—the Bliss & Laughlin difference.

Only B&L Lusterized® cold finished bars are different from all others. B&L bar steel is cleaner, brighter, easier to handle. The exclusive B&L cold finishing process (patent applied for) removes drawing oils, lime and processing grit, producing a smooth, gleaming bright surface without processing contaminants to slow your production. And B&L special protective oil keeps dirt, dust and other airborne contaminants from the Lusterized surface until you are ready to process the bars.

This big difference over other cold finished bar steel is another benefit developed from B&L research since 1891 to produce better cold finished bars.

You can see the difference. You can work the difference advantageously. Since you pay nothing extra for B&L Lusterized bars, it is always rewarding for you to specify "Bliss & Laughlin Lusterized."

Originators of LUSTERIZED® Finish—The BIG DIFFERENCE in Cold Drawn Bar Steel

BLISS & LAUGHLIN

Specialists in Finish, Accuracy, Straightness, Strength and Machinability

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CIRCLE 344 READER SERVICE CARD

PRECISION Quarterly NUMBER 2

PRECISION WELDER AND FLEXOPRESS CORPORATION, 3520 Ibsen, Cincinnati 9, Ohio

STAMPING RECORDS TOPPLE

Husky Flexopresses combine speed and accuracy to turn out cookware and "cookies" at unprecedented stamping rates.

★ *Manitowoc, Wis.* – An aluminum manufacturer is attacking rising costs with an "automatic weapon – peacetime style." it's a 50-ton Flexopress, owned by Mirro Aluminum Company, who declares it is "ripping out machine-gun rates of 680 component parts per minute,"–and shot the photograph above to prove it.

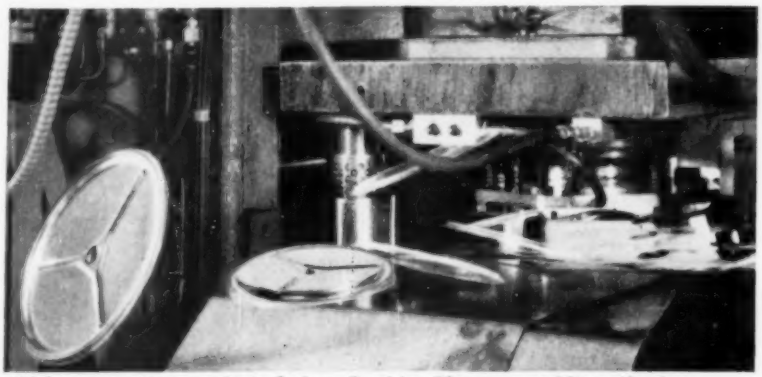
This is music to our ears, here at Precision Welder and Flexopress Corporation. And the Mirro news came right on the heels of record breaking news in the electric motor industry.

★ *Cookie Cutter* – In January, we shipped a 100-ton vertical Flexopress to a Michigan manufacturer of electric motors. He's using it to punch the slots and holes in 0.025 inch thick silicon steel "cookies" at a rate of 300 per minute. That's three times as fast as those silicon steel rotor laminations have ever been punched before.

Think what this advantage means to other motor manufacturers who can triple their production rates and cut costs, too. We know it can be done with Flexopresses. That press we shipped to Michigan punched 345 cookies per minute on its trial run and is *guaranteed* for 250 per minute.

★ *Ball Bearings* – Look closely at a Flexopress and you'll see why it does such jobs so swiftly and accurately. The ram rolls on preloaded ball bearing raceways (a patented Flexopress exclusive). They make every Flexopress a truly precision machine tool, no pun intended. The pre-loaded slides *don't even need clearance for lubrication.* When a press builder guarantees squareness of ram to bed to half a thousandth at any speed and stroke, that's precision, capital P or lower case.

Along about now, when you're thinking what presses like these could do for you, is just the time to call in the Flexopress sales representative and get the facts – fast and accurate.



680 lazy susan trays a minute fly from Precision Flexopress at Mirro Aluminum Company, Manitowoc, Wisconsin. (Actual stroboflash photo.)

Imaginative Handling = Profitable Presses

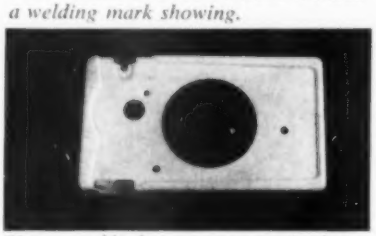
THE SUBTLE difference between a fine fast press and a fine fast press making a profit is precise material handling. This is why Precision has become expert at creating devices to get the stock in and the parts out as fast as Flexopresses can operate (and that can be awfully fast!).

Recently we put on our material handling hat for a really imaginative manufacturer. He wants a line that starts with a 40-inch mill coil of steel and ends with stampings big as an auto instrument panel stamped and stacked on pallets at a rate of 80 a minute. He's going to get it, too.

This really fantastic story can't be told–yet. But Precision is constantly building all sorts of other accurate and dependable devices to feed its presses. Flexofeed, for example (feed rate up to 2500 inches per minute, stroke up to 36 inches, accuracy to plus or minus 0.002 inch). Such devices share the credit for Flexopress records.

VINYL MARKET AWAKENS

MANUFACTURERS ARE just beginning to discover how much the warmth, texture and color of vinyl clad steel can enhance their products. Especially, they like the way this new material can be formed first, and then welded *without a welding mark showing.*



Not a weld shows on magnetic force welded radio case of vinyl-backed steel.

Precision Magnetic Force welding equipment does this tricky job, working from the back (bare) side of the metal. The welding current travels in and out of the same metal face and never touches the coating at all!

Automobile trim, radio cabinets, metal furniture, business machine frames, sports equipment – you're going to see a lot more of this sort of thing with the look and feel of leather, and the strength of hidden weld construction. When you do, look for a Precision welder behind the seams.

Possibly you missed–

These objective articles about other Precision developments:

- ☐ European Foil Butt Seam Welding Process Comes to U. S., **American Machinist,** June 30, 1958
- ☐ Automatic Welding – Forming, **Production,** November, 1958
- ☐ Where Stamping and Assembly Meet, **Steel,** June 18, 1956

Or want more information about these:

- ☐ Precision Magnetic Force Welders
- ☐ Precision High Speed Flexopresses

Check off what you want and let us know. We'll oblige.

Complex job–or simple job

Kingsburys save money on both

600 valve castings per hour gross with a 14-spindle indexing machine

At the left is high production with a variety of tools — five combination tools, two drills, a hollow mill, a recessing tool for the undercut, a counterbore and three taps.

A 30-inch index table holds seven fixtures. Steel jaws in each fixture hold two parts, one in front for the first chucking and one in back for the second. A spring-loaded ram clamps the parts and an air cylinder unclamps them.

Nine self-contained units perform the operations. Seven have single spindles. Two vertical units have multi-spindle heads; each operates at two stations and in both chuckings.

The machine also handles a part with another tapped hole. The units cycle in 4.5 seconds, and the table indexes in 1.5 seconds, so a part can be finished every 6 seconds.

325 aluminum housings per hour gross with a 6-spindle non-index machine

The machine at the right has one fixture. Clamping is manual. Two opposed units drill two holes in line. To avoid tool clash one unit cycles, then a cam-controlled valve trips the other. A vertical unit taps four holes.

Kingsbury machines save money because they produce uniform parts that gage. Good basic design and rugged accurate construction mean few rejects and little down time.

Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY MULTI-UNIT AUTOMATICS

FIRST CHUCKING
COMB. DRILL 2 DIAMS. C'BORE, CHAMFER, SEAT
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STEP DRILL .098 .113 DRILL .070
HOLLOW MILL STEM UNDERCUT STEM
SECOND CHUCKING
COMB. DRILL & C'BORE TAP 2 HOLES
C'BORE DRILL THRU 2 EARS TAP
DRILL
TAP 4 HOLES
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BRASS VALVE BODY

ALUMINUM HOUSING

NEW... adjustable 3/4" Deceleration Valve

Simplifies Cam Design, Cuts Set-up Time, Eliminates Need for Special Valve Spools

These Features are Important to You:

- Controlled deceleration regardless of flow rate
- Reduces set-up time—eliminates experimenting with cam shapes
- One valve can handle all applications from 5 to 25 gpm giving greater flexibility
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- Can be used for applications to 60 gpm without malfunction
- Includes adjustable by-pass needle valve
- Available with or without check for reverse free flow
- Threaded ports or subplate mounting

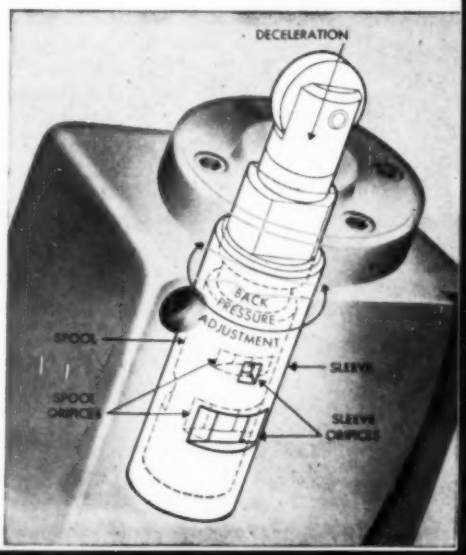
TYPICAL USES:

1. Converting rapid traverse motions to slow, controlled feeds.
2. Rotary indexing operations. Will control deceleration and permit creep to accurate final position.
3. Straight-line transfers. Deceleration control gives smooth stop without excess movement of part being transferred.

Write for installation drawings No. 214322 and I-214323.

Orifice size (through spool and sleeve) is made larger or smaller by rotation of sleeve. Adjusting screws on the face of the valve rotate the sleeve to the required orifice opening. Deceleration stroke length remains unchanged. No special cam shape is required for valve spool travel.

Patent Pending.



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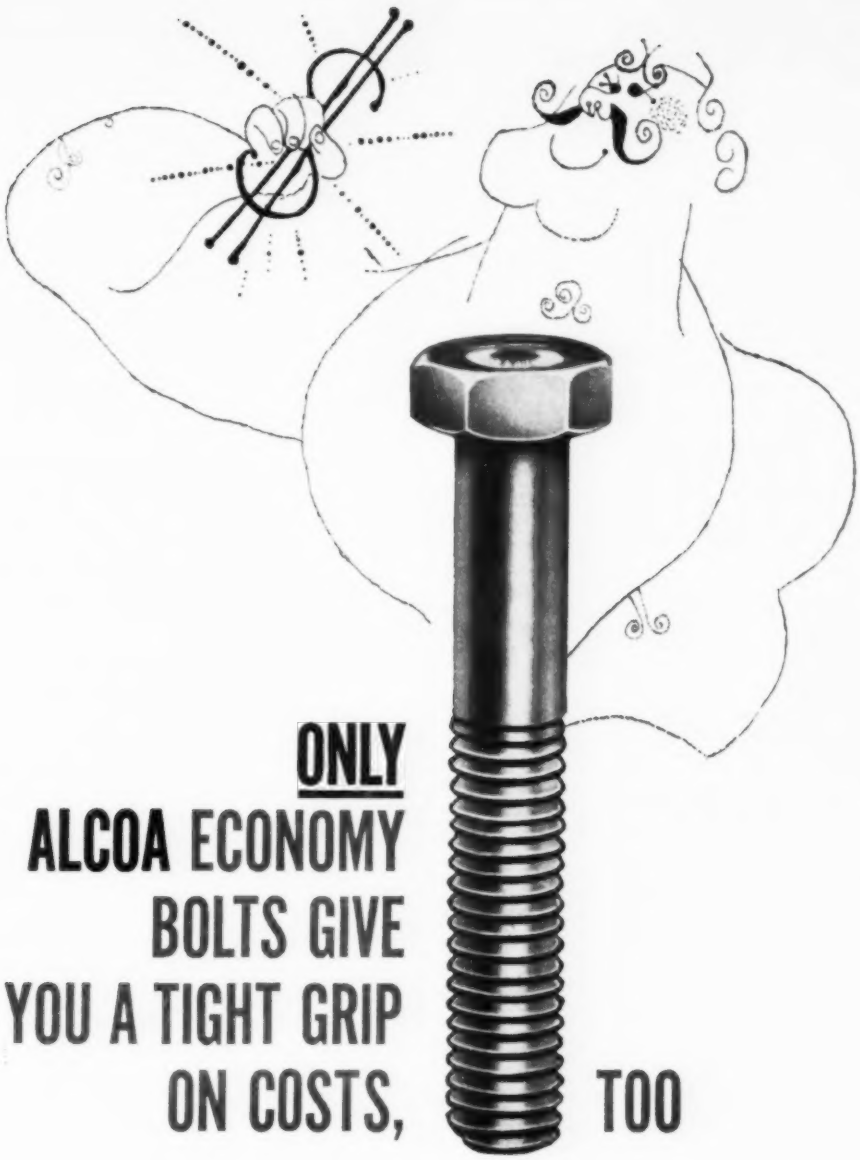

ONLY ALCOA ECONOMY BOLTS GIVE YOU A TIGHT GRIP ON COSTS, TOO

If you want to get tight-fisted about fastener costs . . . without sacrificing product quality . . . better turn to Alcoa® Aluminum economy bolts. Bright and flawlessly finished, they cost less than any other corrosion-resistant fastener. Order them for practically any general application where you now use more expensive trimmed-head bolts. They'll add extra sales appeal to your product *at no extra cost.*

Made to American Standards specifications, they conform to dimensional and tolerance standards for regular hexagon-head bolts. And, remember, you get *full* count, *full* quality when you specify Alcoa Aluminum Fasteners.

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Vertical grinding reduces setups

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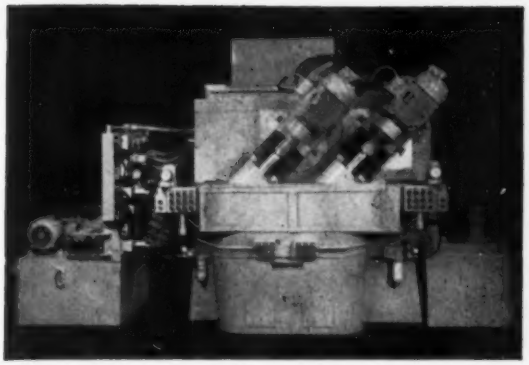
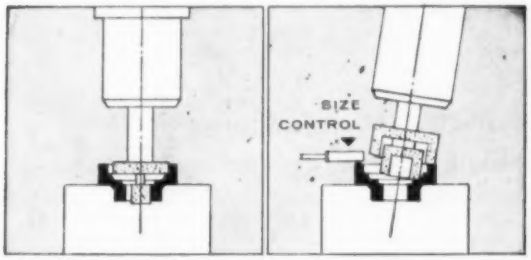


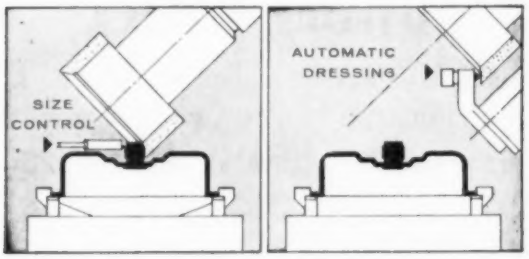
One head grinds while the other retracts for dressing, unloading and loading.

The double spindle Springfield vertical grinder in the photo is typical of vertical grinders automotive production men are using to 1) reduce setups, 2) improve grinding productivity, and 3) save floor space.



Transmission sun gear, 4 surfaces ground in 2 operations.

Two double spindle vertical grinders grind 330 gears per hour. Size control and wheel dressing are accomplished automatically. Typical machine cycle shown below.



Transmission housing hub, 1.-form grinding with automatic size control; 2.-spindle retracted for automatic dressing while operator unloads machine.

When part requirements change, only dresser, fixtures and sizing devices change—the machine itself has a long production life because heads can be repositioned easily.

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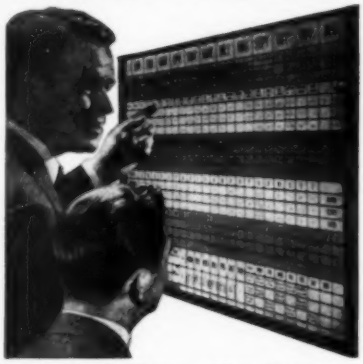

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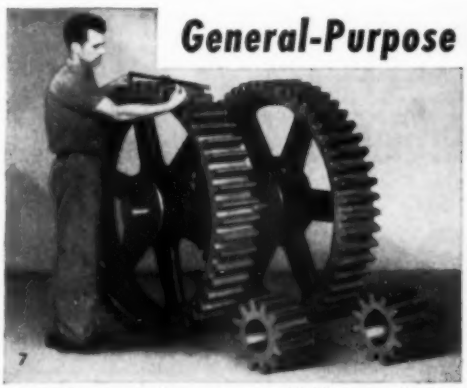

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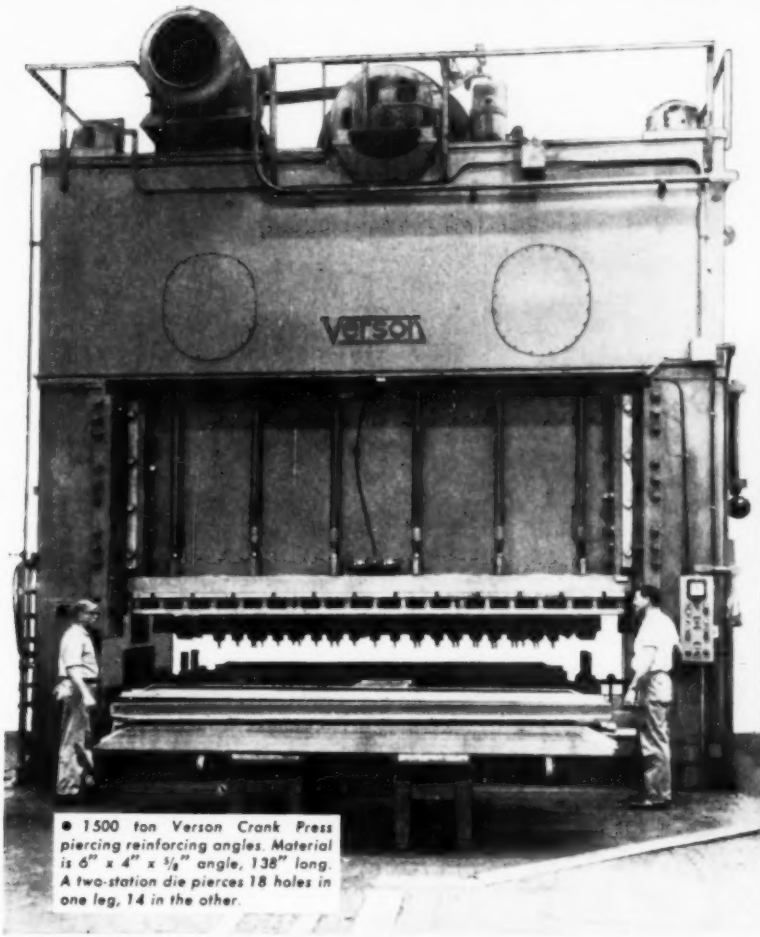

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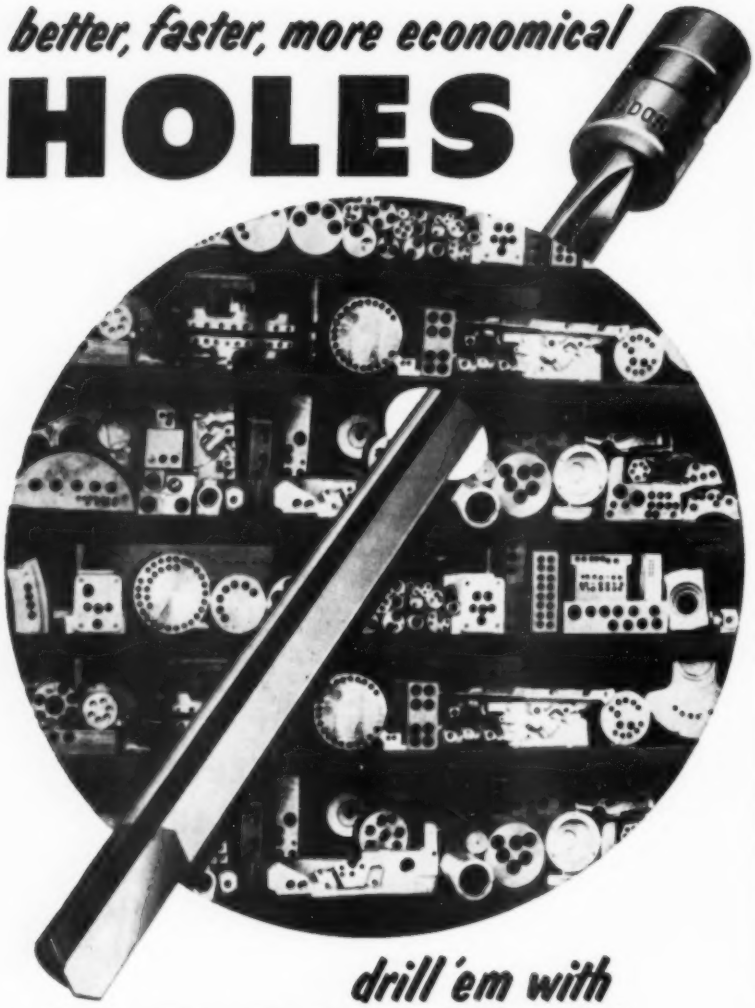

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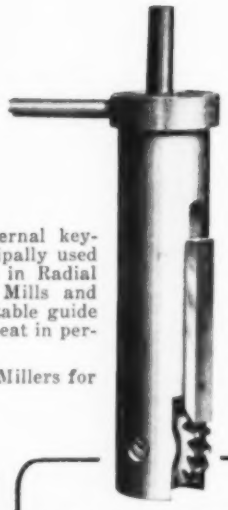

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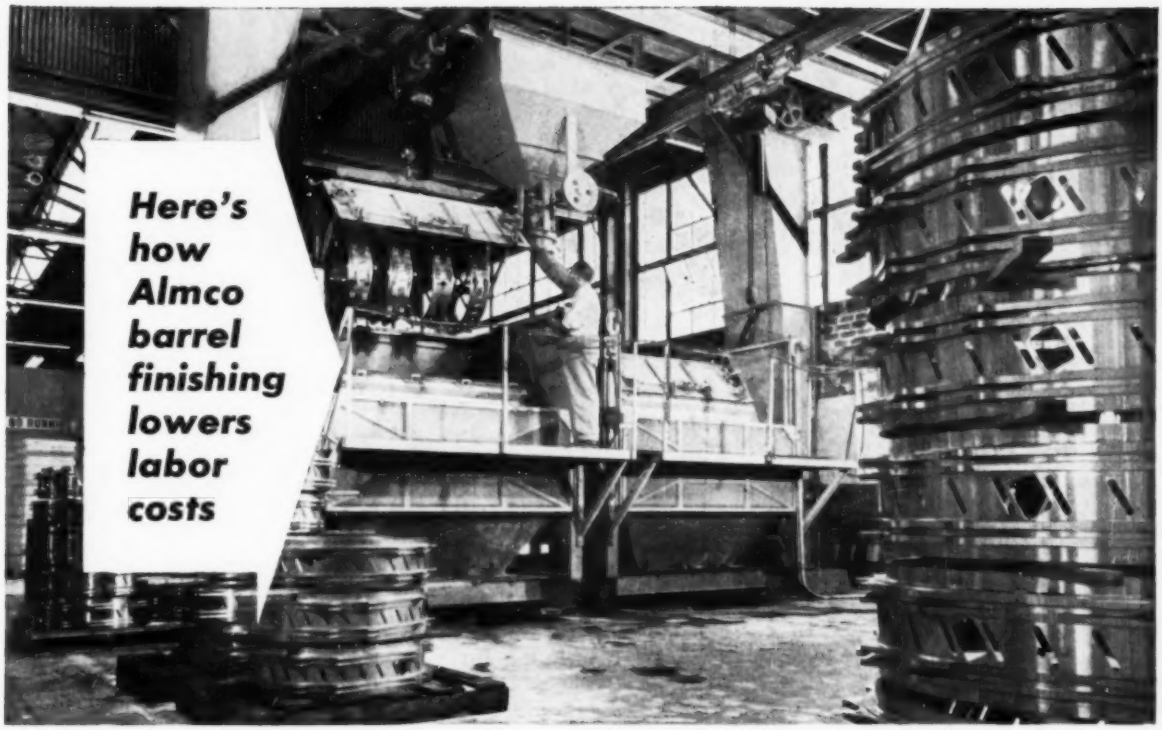

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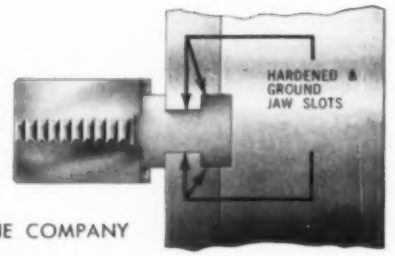

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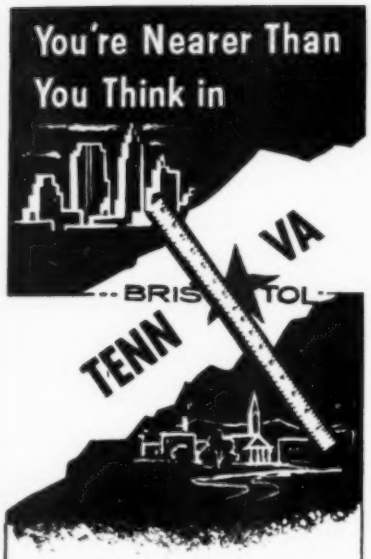

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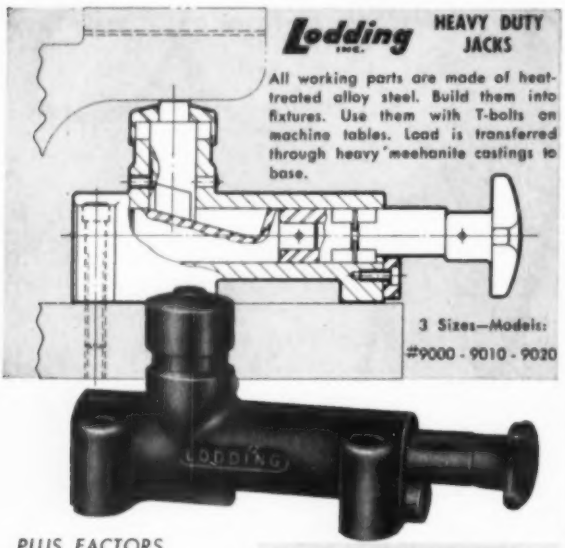
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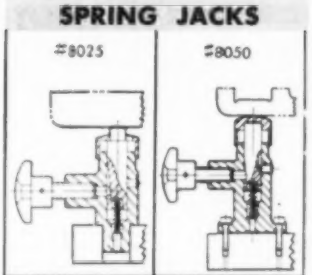

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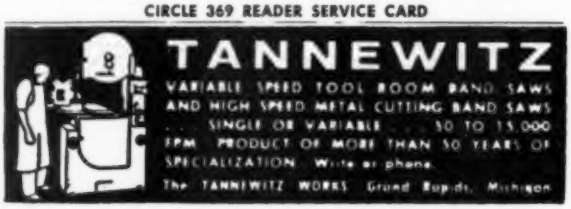
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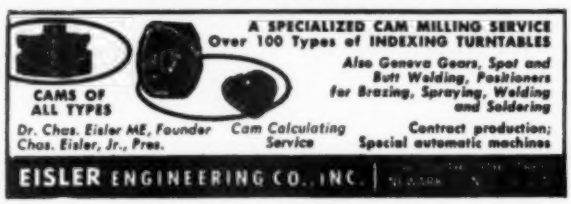
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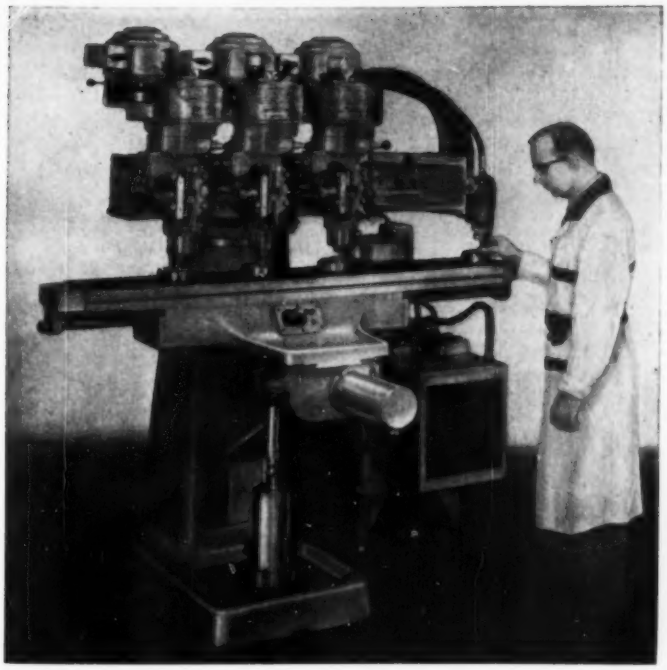

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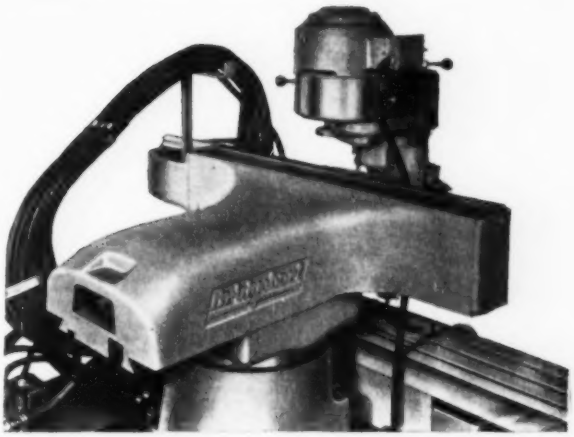

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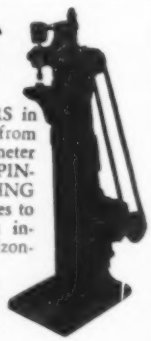

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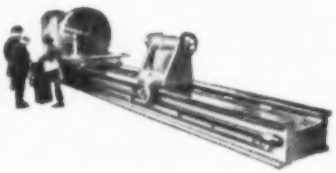

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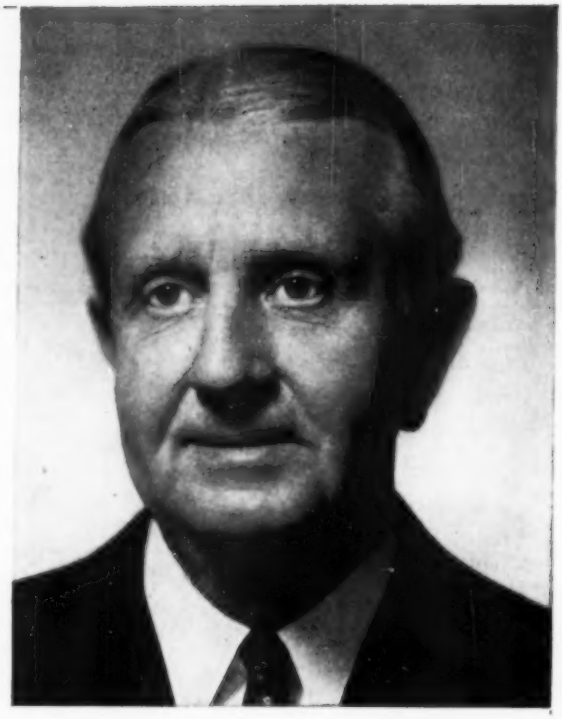

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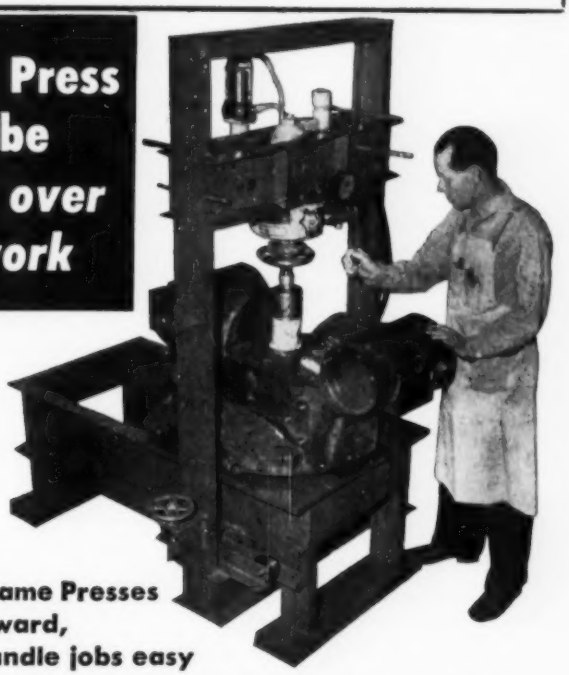

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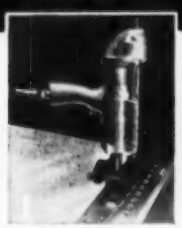

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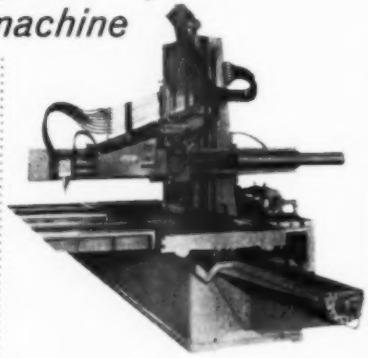

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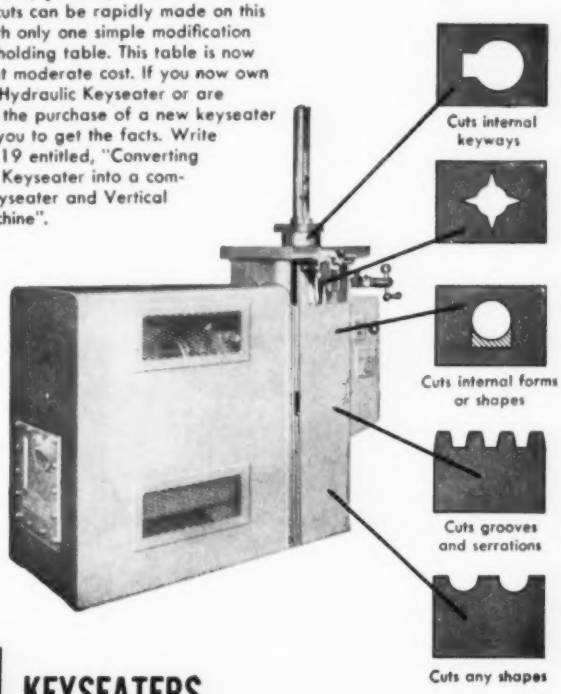

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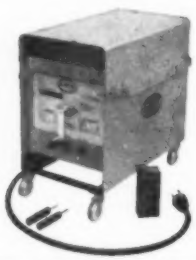

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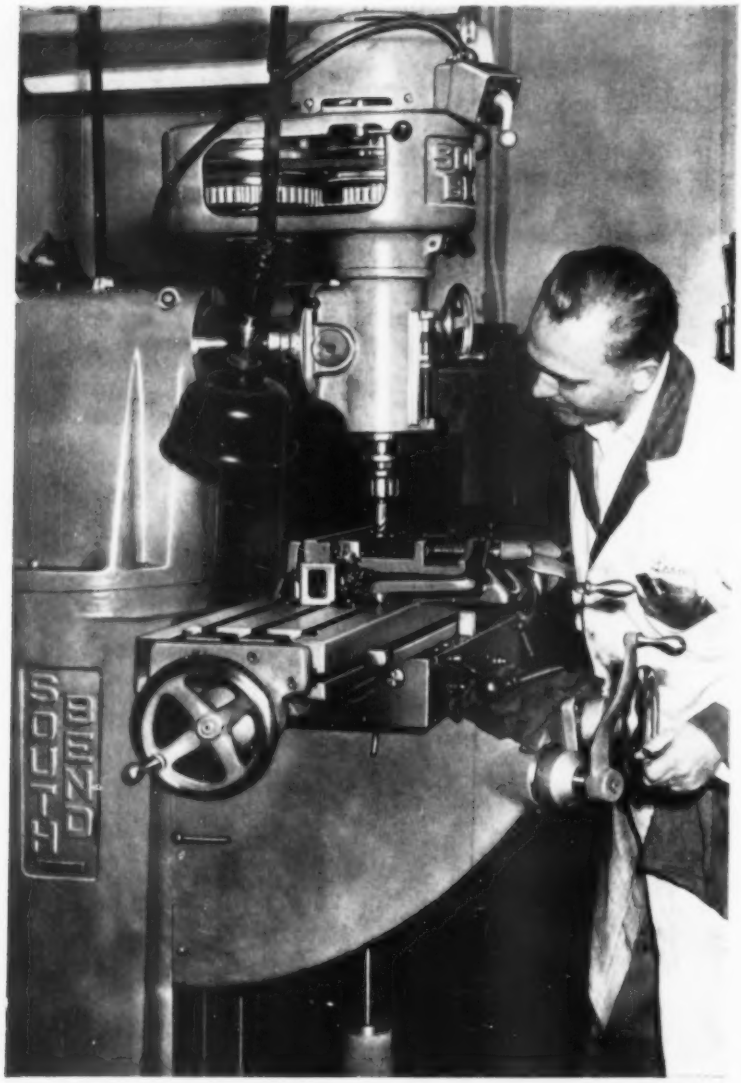

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